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TRANSACTIONS

OF THE

MEDICAL AND PHYSICAL SOCIETY

OF

BOMBAY.

No. VII. NEW SERIES.

FOR THE YEAR 1861.

Bombay:
PRINTED AT THE
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SPECIAL CONSIDERATIONS ON THE HEALTH OF EUROPEAN TROOPS.

BY SURGEON MAJOR D. GRIERSON, M.D., STAFF SURGEON, KURRACHEE.

Presented by the Principal Inspector General, Medical Department.

THERE are facts in history, from which the inference has been drawn that the art of preserving public health, or hygiene, was observed with scrupulous care in ancient times; and it has been even proposed to account for the decay of some celebrated nations of antiquity, on the ground of the neglect of sanitary rules and practices. Be this as it may, it is scarcely conceivable that the importance of those measures, which have for their object the protection of life in its earlier stages, the development of the human being, the prolonged health and strength of man, the vigorous period of manhood, and the gentle decline of life, exempt from diseases and pains, which marks the descent to the grave, can be exaggerated by any effort of oratory or of imagination. When Celsus compared medicine to agriculture, there is reason to believe that he alluded to curative medicine. And in the comparison there is a fitness, but not so universal as if he had embraced hygiene in his view. There lives no man who is not indebted to agriculture for his subsistence and innumerable other enjoyments; and hygiene, thoroughly understood and well applied, is capable of conferring the same extensive range of benefits. For, if man lives by agriculture, it is by hygiene that he lives well. Curative medicine deals with individuals, and though its procedure may be more exposed to observation, its excellence strikes the imagination less, and is really less imposing, than that of hygiene, which deals with aggregate and immense bodies of men. Individuals innumerable have been gladdened by the cheerful fire at which they have warmed themselves, but no one looks on a fire with the same feelings as

when we rejoice in the pleasant heat, light, and splendour of the sun, which shines on half a world. It has been usual to illustrate the same fact by reference to the art of vaccination; and it has been truly said, the discovery of vaccine, which belongs strictly to hygiene, has done more for mankind than the most successful method of treating small-pox ever could have effected. And it has been said, to employ means to rid the inhabitants of those countries where it is endemic, of yellow fever, and it may be added, of cholera, would confer on those who are subjected to the ravages of these scourges a far greater benefit than the use of any medicines, however efficacious, which should cure the greatest possible number of those attacked by these diseases. One reason of this is obvious. When a man is cured, he is snatched, in the midst of pain, anxiety, and sorrowing friends, as it were from the jaws of death; but when a man, through the aid of hygiene, has never become the victim of disease, he has enjoyed, it is plain, uninterrupted health and vigour, has had neither the pain nor sorrow of sickness, and needs neither cure nor deliverance. Another less obvious reason is, that when endemic and epidemic diseases prevail, the people of those visited localities suffer generally, whereas some only are attacked by overt disease. Now, the latter only being the subjects of treatment, they alone derive benefit from medicine; but a perfect hygiene, on the other hand, in destroying the noxious agency which produces diseases, renders the relief procured by medicine unnecessary, and preserves not only to those who would otherwise have suffered from disease, but to the whole population, undeteriorated health, entire vigour, and unimpaired enjoyment.

But though, when we view and compare in this manner curative medicine and hygiene, the superiority of the latter becomes conspicuous, it would yet be a great error to suppose that there is any repugnance between them. Man is to each the object of study and investigation; the ultimate end of both is health; physiology and œtiology they have in common; and in respect to chemistry and physics, much is claimed by either, though these belong specially to hygiene, as medicine does to the curative art. The grand distinction, however, is, that curative medicine is directed to the body of man, and seeks to

modify actions which are taking place there; whereas, hygiene turns to agencies which exist without the body, and act injuriously when brought into contact with it; and her aim is to anticipate their development, or destroy them when developed. The close connection subsisting between them is shown by the fact, that it is in towns, fleets, and armies, where medicine has been most required, that hygiene has won, if we except only vaccination, her highest triumphs, and that the most distinguished advocates of sanitary and hygienic measures, the pioneers of all progress in this noble course, with perhaps one exception, have been members of the medical profession. If jail fever, hospital gangrene, scurvy, small-pox, and some other diseases, have now disappeared, or are extremely rare in the fleets, armies, and prisons of the United Kingdom, this exemption is the result of the well-directed knowledge, zeal, and perseverance of the medical officers who have served the public, and who, however successful and happy in the cure of disease, have recognized the prevention of it as a nobler office. The attention of the public, through their labours, is now awakened to the subject, and whatever appeals to it in the interest of hygiene will be received, we may believe, with respect, and treated with deliberation. Encouragement is thus held out to pursue studies connected with this branch of the profession. Indeed, the time may not be distant, when the successful cultivators of this science, who may possibly save an army from destruction, shield a town from poisonous influences, or a district from pestilential disease, will be honoured with less unequal regard, and with rewards less dissimilar to those which wait on the eminent statesman and successful warrior.

Of a humbler character, however, are the considerations now offered to the Society, yet by no means unimportant. Their aim is to regulate moral affections, which generate pernicious habits, or, by indulgence, vicious hurtful passions; and which, as is implied by the very terms, subject man to violent agitations, injurious to health, and enslave him too often to dominant destructive influences. Their aim also is to procure for soldiers in their habitations good and pure air, and to purify the air, in the vicinity of their habitations, from every noxious property or foreign

substance it may contain. It will be considered, it is imagined, a good achievement for whoever effects it, and somewhat to the credit of whoever attempts it, to raise the character of the soldier, secure to him a higher standard of health, and a greater immunity from disease, enlarge his means of enjoyment and improvement, and preserve to him the privileges of the citizen, while he is also rendered more capable of the performance of his duty as a soldier.

Were this the first time I had turned my mind to the considerations about to be entered on, I should think it presumption to submit them now. The case, however, is different; and as with me the subjects have both a history and a special character, I shall proceed to deal with them in a chronological order, as well as in an expository method.

The subjects I wish to treat of are Intemperance, Prostitution, Accommodation, and Medical Police, as they affect our English army in the East.

From October 1832 till July 1835, I served in the Indian Navy, and observed facts connected with the issue of spirits to the men, which led me to submit a statement on that and other subjects to the Superintendent Indian Navy, then Sir Charles Malcolm, and to urge a diminished supply. The reply was, "In every part of your arrangement regarding the allowance of spirits the Superintendent fully concurs, and it is very satisfactory to him to have so many proofs adduced, as you have done, in favor of a reduced quantity." In the year 1838, in connection with a detachment of Her Majesty's 40th Regiment, the subject was again forced on my notice; but without practical result. In regard, however, to the canteen system, and especially that part of it which provides for the accummulation of profits by the sale of spirits, and the expenditure of these profits for what were called charitable objects, the note I made of it was, "Thus, by a most singular arrangement, the very vice of the soldier is made to provide for him in the day of his misfortune, and he is tempted, under the delusion that what he spends is not all lost, or at least benefits others, to part with his money, ruin his health, and acquire those habits which may render him a torment to others, or effect his own destruction." Since those

days, indirect ways have been taken to diminish the taste for spirits and the use of them. It was indeed before that time, namely, in the year 1830, that spirits, as part of the soldier's ration, had been abolished; but, in 1847, the introduction of porter and beer was intended to promote the same object. Coffee-shops are strictly enjoined by the canteen regulations, and regimental libraries have been established, and have been justly thought to conduce to the same result. And to these means, and in the same category, are to be added ball-alleys, skittle-courts, and workshops.

While these indirect methods have been tried, it would seem as if it were not generally known, to judge by one of the questions put by the Commissioners on the sanitary state of the Indian Army, that the more direct voluntary plan of temperance societies had been discouraged and suppressed in the Army. This was done many years ago, and in consequence no means at present exist to enable any one to supply a comparison of the ratio of sickness in abstainers and among those who use spirits. But comparisons of this kind were made in former years, and it may be well to produce one of them. The following statement is taken from the *British and Foreign Medical Review*: "A temperance society was established in the Cameronian Regiment in 1837 at Fort William. The Surgeon, Mr. Bell, reports most favorably of the results. The admissions into the hospital were—of the society, 1 in 25; of the rest of the regiment, 1 in 11. The deaths in the Regimental hospital were, in 1837, 26, and in 1838, 22; whereas, for 14 years previously, the mortality had been nearly 72 per annum. The consumption of spirits has diminished from 14,000 gallons (which was the amount consumed on the arrival of the Regiment in India) to 2,516 gallons. Liver complaint has diminished from 111, 140, and 135, as in 1832, 1833, and 1834, to 82 and 50 in 1837 and 1838. It also appears that, by temperance, two-thirds of the sickness has been removed."*

To this exhibition of facts, the result of abstinence, it is impossible to add force; neither can one forbear to deplore that so promising a movement was nipped in the bud. This is not the place

* Ed. M. Jour. of Medical Science, No. VI., June 1st, 1841.

to offer many remarks, yet it is desirable to allude to other changes. It was thought a very great and beneficial advance, when, in 1830, Lord Hardinge, then Sir H. Hardinge, abolished the spirit ration; and this merited the commendations it received, when spoken of as an act of wisdom and courage. Perhaps, but for this, other measures would have followed more slowly. Be this as it may, in 1837 good conduct pay became an institution; in 1844, Savings Banks; in the year 1846, flogging was limited to 50 lashes as a maximum; and in the following year, the sale of spirits, as distinguished from the issue, was put a stop to in canteens; service on enlistment was limited to 10 years; and regimental schools were introduced.

A century and a half ago, that soldiers were a body of men distinct from the body of the people, governed by different laws, whose only principle was blind obedience, and that they could not be made obedient to the allurements of rewards, as coertion, generally speaking, is the surest principle of all vulgar obedience, were approved maxims; and at a much later period, it was publicly stated that "the worst men were the best soldiers." The changes above alluded to are evidences that the ancient prejudices and practices of an evil day are gone for ever, but the question is, what effect have these changes had on the Soldiers as regards drinking? It may be conceded at once, that they have been beneficial; that they have not gone far enough, there is reason to believe. I take up a Medical Journal published last year, and I find that in one Regiment three Canteen Serjeants perished of *delirium tremens* in 18 months. The Surgeon remarks:—"The Canteen Serjeantcy seems to be allotted as a kind of reward to the steadiest and best men of the longest service, whose previous good conduct, however, seems literally unequal to the great temptation of a free access to liquor."* This reminds one of the maxim—*Nemo mortalium unquam fuit repente turpissimus.*

I have seen within three years one soldier brought to hospital a corpse, who, drunk, a prisoner, and being taken to the guard room, tried to escape, and was killed on the spot by one of the guard, who threw his bayonet at him; and I saw

* Transactions Medical and Physical Society, Bombay, No. V., New Series, p. 175.

another, who had just been killed by a drunken antagonist, with whom he had retired from the barracks to end a brawl by fighting. Within the same time in one year, I treated for *delirium tremens* ten men in a company of Artillery of about 100 strong. The Staff Hospital Kurrachee receives the warrant officers of the arsenal, commissariat, and other establishments, the men of which departments, it is believed, may be considered the picked men of the services; yet from amongst them, a small class, in the last four years there have been nine admissions for *delirium tremens*, and one of these members of this class perished in this horrible disease. In mentioning these men, I have chosen, as a proof of drunkenness, extreme cases, but this procedure, the only tangible one, is open to no objection; for every case of *delirium tremens* represents, besides a deplorable individual instance, an undefined but certain amount of drunkenness, it may be ten, fifty, or a hundred to one. Proofs, however, are scarcely needed; for I suppose no one conversant with the subject will deny that by a great majority military crimes owe their origin to the love of drink, or the consequences of indulgence in it.

It remains to inquire if anything can be done to lessen intemperance. The preceding narrative points out temperance societies as an efficient beneficial agency. And these ought to be encouraged. Men are influenced by example; example derives force from numbers. A society developes this force and displays it; and is a quiet antagonist of drunkenness and a protest against it. It is a rallying point, and will always attract some to support the cause it represents from amongst those who esteem it more noble to overcome evil with good, than to be overcome by it; and better to assume an attitude of opposition to this special evil, than to be indifferent. Instruction, amusement, and occupations, are all subsidiary means of raising the character of the men, and enabling them to despise debasing pleasures and resist seductive habits; and it ought to be received as a maxim, that when any one is addicted to vice, unless a feeling of opposition to it be raised in the man's own mind, prevention will only stimulate ingenuity, and punishment suggest greater caution in the means and measure of indulgence. But the eradication of drunkenness from the army depends not on desultory indirect efforts. It

must be the result of a system. Such a system, it is conceived, is possible, and has nothing of an active or aggressive character about it. It has rather a negative character. Its chief feature is to let the men alone. And if evils arise from this inaction, then it would be required to deal with them as evils. The present system is erroneous and inconsistent. To say nothing of enormous cost, to say nothing of lacs of rupees lost in condemned porter; or of the £5,000 per annum paid simply for coverings of mat to protect the transport boats on the Indus; to say nothing of the impracticable nature of the present plan in time of war, or the huge monopoly; spirits were at first allowed to soldiers on the wrong principle, that the addition of spirit improves the quality of the water when bad, or makes it innoxious when hurtful; and what was granted at first as a bounty, was soon claimed as a right. There is neither room now for the illusion, nor ground for the claim of right. And what is wanted is, that the State cease to be a great hotel-keeper, and abandon all those allurements to their customers, such as charitable donations out of the Canteen Fund, the provision of balls, quoits, and necessaries for games and amusements, supplied from the same source, which throw a covering over the nakedness of the system, and impart to it an interest not rightly belonging to it. Until this is done, there is an inevitable inconsistency in the fact that Government supply, as every one must allow, daily opportunities and means of drinking to the soldier; and, as most think, really train him, in many instances, to become a drunkard, and then punish him, when his passions, habits, and infirmities lay him open to faults and negligences, or stimulate him to more active crimes. Let Government abolish the Canteen, and stand aloof from the provision and sale of liquor, and the officers of Government can come in contact with offenders not only without embarrassment, but deal with them, strengthened by the awe inspired by a just and venerable authority. In this case, in all its functions, Government would be in direct opposition to drinking habits, as well as the evils they lead to. The contrary is exemplified now. Liquor paid for by the soldiers is provided by Government, and, though paid for by the soldier, yet access to it is a privilege; the privation of access a punishment; and by restrictions and indul-

gences multifarious, interference minute, and misspent care, a factitious interest is created in what ought to be left to stand simply in its own nakedness and ill-desert. Not only in dealing with crime does the present system lead to embarrassment; a prior charge lies against it, as it affects moral responsibility. When drink is provided by Government, when peculiar advantages are procured to soldiers by the profits of drink, human nature were no more human nature, if drinking, accompanied with so many adventitious recommendations, were not the rule in a Regiment; and if example so highly commended and sanctioned did not beget an imperious fashion, and lead young and old, with exceptions no doubt, captive at her will. In this state of things, young soldiers are scarcely left free, especially after the punishment,—like privation of liquor while at drill; and surrounded by influences, all of which appeal to them in behalf of the practice, it is no wonder if the soldier soon learns to drink, and falls a prey to a habit which soon gets beyond control. To redress evils of this kind once fostered is impossible To prevent them for the future demands and is worthy of the greatest solicitude; and the means to accomplish this end, as before stated, seems to me to be, that the Government stand aloof, that no dazzling halo be cast around drinking practices, and no sanction be lent to what is too often a commencement of moral delinquency, and what must be often dealt with in its results as a crime. Besides, when the soldier has neither sanction nor facility for drinking provided, he is fairly and honorably cast on his own responsibility, his interests are in his own keeping; he is dealt with as a man, not a pupil; his nobler interests are appealed to; he yields to the appeal; and, instead of a descent of progressive debasement, he enters on a course of progressive amelioration. The result of this negative action on the part of the Government will immeasurably benefit the soldier, add strength to the army, shed lustre on a wise administration, and remove a national reproach.

As there is always a presumption in favour of established usages, so no innovation upon them can be proposed that is not met by objections. Possibly, some may yet urge that alcohol gives strength, and adds to productive energy; some, less proba-

bly, may say that alcohol protects from diseases to which soldiers are exposed, especially fevers. These were once favorite arguments; and if pressed by the fact of ill consequences resulting from drinking, the advocate of alcohol would profess to obviate the objection by proposing the dilution of spirits or substitution of beer and porter for spirits. But as these measures have been tried, and drunkenness yet exists, the great, if not only, argument now is, that the Canteen secures good liquor, and if it were done away with, the men would resort to shops or taverns where bad liquor would be procured and the health of the men injured. The reply to this is, the difference implied in the terms good and bad, when used in respect to liquor, is not what the words themselves signify. It is a difference not of contrast, but comparison; not of kind, but degree. Whatever change would follow, therefore, in regard to liquor, is one not absolute, but limited, both in the quality of the liquor, and in the effects produced by it. It may next be observed, that soldiers do not use bad liquor rather than good, as a matter of taste. They use what is cheap and easily procured. A monopoly, if it secures a good commodity, compels unscrupulous men to seek hazardous and precarious gain by illicit and spurious substitutes. Competition, by bringing the good to a lower level, cuts up the roots of the illicit traffic, and the measure proposed, therefore, contains in itself the remedy for the evils alleged, as likely to follow it, or rather will prevent the occurrence of them. But again, the objection has no force for this reason. Crimes and disease exist already in the Regiments. Either, therefore, these evils originate in the Canteen, or they do not. If they do, it is a reason to abolish them. If they do not, they arise from sources beyond the limits of the Regiments. And if so, and this will hardly be denied by any one, then the very evil dreaded exists already. Illicit liquor is procured by unlawful means, and the health of the men injured by spirits, used beyond the prescribed degree. The objector then must show not that men would get bad liquor, but that they would get it worse or in greater quantity than they do now. But this he cannot show. On the contrary, it has been rendered evident that were the Canteen abolished, the evil would be diminished or cease.

The conclusion come to then is, that the canteen should be abolished, men left free to drink or not as they choose, the military crime of drunkenness discouraged, and if need be punished, and drunkards if they be found under the new system, weeded out of the army.

In the letter before alluded to, addressed to Sir Charles Malcolm, attention was directed to a practice which had long existed in the Indian Navy. What I mean is, the countenance of prostitution. When a ship was in harbour, boats might be seen in the evening lying near, full of prostitutes: at a given signal, permission being granted to come alongside, the sailors might then be seen rushing to the boats, each to select his partner for the night, as a butcher might be imagined to select fat lambs from a flock. This fact is valuable, as an indication of public opinion; but I mention it to the credit of Sir Charles Malcolm, that a system so abhorrent to right feeling, and so prejudicial in many ways, was no sooner thus officially brought under his notice, than it was abolished.

Again, about the year 1840-41, being then a Regimental Assistant Surgeon, I pointed out the evils resulting from the residence of prostitutes in bazars, the suffering to individuals induced by it, the loss to the State, and the advantages that would result from their expulsion. My representations I believe never reached Head Quarters; but were met by the military authority, and resented as an interference with what did not concern me; and by the medical, as being a matter with which it was not felt there was any call to meddle. It was but three or four years before this, that the "Lock-hospitals," so called, had been abolished by order of Government, at the instance, urgently repeated, of the Bishop of Bombay, and supported by the strong arguments of the then Metropolitan of India. Regret was very generally felt and often expressed at this abolition; hence the indifference, or hostility, with which any further step was encountered.

It was not till lately, about two and a half years ago, that I felt again disposed to take up, or justified in referring to, this matter, in an official manner. In an evil hour, and in ignorance apparently of what had been done in former times in the extinc-

tion of *Lal-Bazars*, and of the late orders of Lord F. Fitzclarence, it was resolved to institute what was called a Venereal Dispensary at Kurrachee. I will not relate the history of this short-lived institution. It is my object rather briefly to show the objections I entertained and urged against it. It was pointed out that, for 500 years at least, the law of England regarded the prostitute as a criminal; that this was also the law of India, by the enactments of its Supreme Council; and that it was the law of the military bazars of the Bombay Presidency; that the object of legislation has uniformly been not the regulation of an admitted evil, or the protection in any way of those who favour or commit it, but the punishment of the offenders and the suppression of the crime. It was shown, that Christianity condemned prostitution; and the remonstrances of Bishop Carr and of Bishop Wilson were quoted, which they urged against "Lock-hospitals." It was then added, what is rooted in religion and embodied in law, must also be seated in human nature, unless indeed the first be fictitious and the second usurp a power and an office where neither are rightfully due. But this conclusion cannot be drawn in this instance; for so long as modesty, integrity, self-restraint, honor, chastity, are reputable qualities of the individual, commendable and excellent, so long must it of necessity be, that the dissolute,—those abandoned to the sway of one of the basest passions, the sexual appetite,—shall be held as evil-doers, corrupt, and corrupters, by practice and example, enemies to social well-being, fallen, or who ought to fall from the privileges protection and enjoyments of society.

It is the voice of reason and of nature that, if we would cherish whatever is loveliest and dearest in our estimate of human character, we must set the stamp of reprobation on all that tends to diminish its production, to render precarious its continuance, to impair its lustre, or to annihilate its existence. Nature, religion, and law, then, all concur in visiting the prostitute with their peculiar penalties,—moral spiritual and legal,—and heavy is the responsibility of those who lightly set them aside. To do so, in truth, is to take the opposite view altogether; for if we once depart from the wholesome principle of viewing the prostitute as a criminal and as a violator of moral law, what little soever

notice we bestow, it is countenance bestowed; and how little soever we regulate her affairs, it is protection and reward.

But it might be objected, it is not reasonable to deny the woman aid in her distress any more than to forbid assistance to be given in any case where the imprudence of the sufferer has been the occasion of his malady. To this it is replied, all sufferers from disease, though themselves the cause of it, address an irresistible claim to the sympathy and aid of the physician. On this there is, there can be, no dispute. Patients suffering from *delirium tremens* are cared for with the greatest solicitude; and so are women labouring under venereal disease; nor is less done for the greatest of all criminals, the man who with sacrilegious hands has violated in his own person the sanctuary of life. But no rational man can fail to have some respect to the consequences of his acts, and in the instances advanced or any other of the like kind, when a comparison is instituted, it is easy to see that a special peculiarity attaches to the case of the unfortunate female. In other instances, the victims of self-inflicted disease, when restored to health, are thrown upon their own responsibility. The health and improved condition they have gained form no necessary preparation for the unavoidable issue of renewed vicious indulgence. The lesson which teaches the connection of vice and suffering has been brought home to personal experience; on this may be grounded an exhortation and appeal to a mind consciously awakened to see the nearness and magnitude of a danger hitherto little appreciated; and the conviction which springs from these truths is happily found to be not always unavailing. But the restoration to health of the female is the very condition of the resumption of her nefarious occupation, and qualified again, as she is, to this resumption, her necessities impel her. She may feel the sense of responsibility keenly; may weep over the past experience of her sorrows; may shudder at the prospect the future offers to her; but we have qualified her to tread the path she trode before; and that thorny path, if she would live, she must tread again. Now to warn, exhort, dissuade from evil in such circumstances, if that be all we do, is little better than hypocrisy, and means little else than reproach. And we see ourselves reduced to this extremity, that

either we must act in a way outrageous to humane feelings, or by our silence, though accompanied with inexpressible pain, seem to countenance a course which we abhor. It may be worth while to illustrate this point by way of analogy. Those who suffer injuries in following occupations and trades are humanely cared for, and treated at public expense, or by private bounty. When the endeavour fails to restore a useful member of society to his place and functions, a debt is paid to the unfortunate, and compassionate feeling is satisfied. If the result be more fortunate, a benefit is conferred in the restoration of a useful member to society. Suppose, however, that a society of mistaken philanthropists should follow an army to cure the wounded of the enemy, and to restore them to their friends again to fight against the country of their benefactors, this conduct would be absurd, and the humanity of it would be lost sight of in the contempt and scorn, or direct opposition, which would be turned against so unwise and unpatriotic a procedure. Or again, imagine a state of civil disorganization, where thieves and burglars should often meet in conflict a feeble police, and where wounds and severe injuries were frequent. Imagine further, that a benevolent society were constituted to shelter, provide for, and cure these lawless combatants, and when cured, to dismiss them to pursue their disorderly life, would not the act of humanity be forgotten in the indignation felt against those who evaded the law, harboured, aided, and encouraged the disturbers of the peace, the enemies of the public safety? But these fictitious cases are similar in principle to the institution which should simply take charge of the prostitute, when unable to follow her unlawful occupation, feed, clothe, shelter, cure her; and then as soon as fit to resume them, dismiss her to fall again upon her evil practices. Hence, the conclusion seems just and reasonable. Let there be simply a dispensary or hospital opened, provided with necessaries and the requisite attendants, for the reception and cure of women who live by prostitution, and become diseased by following this mode of life, where shelter, care, and cure, are all gratuitous, and the condition of obtaining the advantage of them is the attendance, or residence of the applicant; let the plan be as remote from the system of continental Europe,—registration,

domiciliary visits, compulsory inspection, and medication,—as possible, and as consistent with the liberty of the subject and the protection afforded by law as can be desired, still there attaches to the modified scheme a character, the vices of which exclude it from the category of legal institutions, and bid away from it the cold approval the moralist and philanthropist would feel disposed at first sight to bestow upon it.

But it is not alone by an appeal to fictitious analogies, or by the assertion of undeniable principles, that we reach this conclusion. Tried by practical application, the Institution, and the associations it provokes, challenges only reprobation. This point was put forward in reference to the establishment set on foot at this place, and I desire it should be pointedly mentioned, that nothing has appeared in public to lead to the belief that, though the "Lock-hospital" at Kurrachee was abolished, yet similar establishments do not exist at Poona and Belgaum to this hour. The remarks to be repeated here, therefore, have a living interest at this moment. Were it otherwise, yet their repetition is desirable; for it seems as if most minds never contemplated any other means of abating the evils of venereal disease amongst troops except the establishment of "Lock-hospitals," and the proposal is continually coming to view, put forward it is believed, by men who not only know nothing better, but have never heard of any other plan or possibility of dealing with an admitted evil, a detriment, and reproach. Speaking in regard to the establishment of a venereal dispensary at this place, it was said,—These things are done not in accordance with any known law, but in opposition to it. Women of disreputable character, the law enjoins, should be expelled from Cantonment; but this is not done. They are countenanced and permitted to remain. When sick they are lodged, fed, and receive care and medicine, at the public expense, as if they were valuable members of the community or servants of the State. And what a contrast do the industrious and decent inhabitants, as respects their treatment or the neglect of their necessities, afford! It was proposed to take their school from them for the accommodation of their vicious neighbours. When sick, what care do they receive? A few applicants, and an occasional inmate of the female sex are seen at the General

Hospital; but let returns of all the hospitals in Sind be called for, excepting at the same time the patients in jail, and perhaps not half a dozen will be found. Again, I have attended, in the dwellings of the Native poor, women in child-birth, some of whom I am as certain as one can be in such matters, but for help must have died, and some of whom earlier relief would have saved from death; but who ever heard in the Provinces, and only lately at the Presidency, of a Maternity Hospital, an institution than which few could be more desirable, and none bear a higher stamp of Christian philanthropy? In plain terms, and this statement in its general extent cannot be denied, the vicious, whom law religion and morality condemn, receive indulgence protection and support in their necessities from the public money; while the honest industrious respectable, however necessitous, are not thought of, or viewed with unconcern apathy or contempt.

If we enquire what effects such a practice is likely to have on the minds of others, we shall find it far from salutary. The woman is encouraged and confirmed in her evil courses. The soldiers are countenanced in crime; and if they contract disease, will be apt enough to reproach the Government which has held out a false hope of immunity. Decent inhabitants cannot but be perplexed when they think that a Government, which in principle approves of honesty and industry, should yet make its special favorites, the impure, the corrupt, the disorderly; and in their bewilderment, they will probably lose what little hold on their confidence and affection, as nature and duty teach them, the rulers of the country are entitled to and enjoy. Nor is it impossible that the parents of Christian youth in the cantonments look with dread on an establishment, where the modesty of tender years may be endangered, and vicious habits contracted under sanction of authority.

But as respects the soldier, who rejoices not in his improved condition of late years? Who is there who sympathizes not with every regulation directed to his elevation and well-being, as a man and as a Christian? And not a little has been done, and with no little effect in late years. The schools in regiments; the ten years' enlistment bill; good-conduct badges and pay, all indicate the same purport, and tend to realize the same desirable

result. All address themselves to his capabilities of improvement and moral elevation, and all are intended, by bettering the condition of the soldier, to raise the character of the service, facilitate the supply of men to constitute an armed force, and to make that force when constituted more valuable and efficient. Now, the institution under review, is not in harmony with these regulations and usages. It does not facilitate their action, but is opposed to them and detrimental. The dissolute soldier, the man under the tyranny of lust, is the discontented, needy, dishonest, drunken, untruthful, quarrelsome, disobedient, and negligent soldier; and this institution is designed for men like these, or will make men like these. The good can have no benefit by it. Their concern with it is, to deplore its existence, and regard it with alarm and abhorrence. It is therefore the antagonist of the school, the church, the reading-room, the play-ground, and everything, which is brought into use or may be brought into use, to make the soldier an instructed, a contented, and a happier man. I can conceive the incredulity with which those who best love the soldier, and most earnestly, consistently, and successfully seek his amelioration, would hear of an institution like this being organized in these times (May 1858) and at this time of day; but I cannot conceive the horror with which many would receive the evidences of its existence.

If it should be asked, how then deal with the offenders in the bazars of this class? The answer is,—as the law directs. Expulsion is that law. If it be objected, that this is cruel, that evils will follow it, as well might it in any case be said that justice is cruel, or the law, tyranny. Execution of the law occasions distress, gives rise to evils; but execution is not a daily office, and it is enforced that greater distress and greater evils may be anticipated. And as for evils to come, the fallacy is easily exposed. We must not do evil that good may come, is an admitted truth; as we must not do good lest evil may arise, is an oft-enacted fallacy. The good in the latter case is positive, the evil only contingent; and if the evil comes, for every wrong and for every evil there is a remedy. The course therefore is plainly marked, and if we believe in a moral Governor of this world, who delights in goodness, we cannot refuse to acknowledge,

that in this very faith, he has given us ample encouragement to prosecute what is good, and just reason to think that he will favour the good and set his face against all that is evil.

It has been already shown how repugnant this establishment is to law, religion, and morals, and it is not meant to recur to that view of the subject. But to cut off all objections, if there must be an institution for the care of the prostitutes, it is desirable to indicate the principles on which it might be legally founded, and honorably conducted. Examples of institutions of this kind are seen in Great Britain and Ireland, and the great Scott, the commentator, was chaplain of the London Lock Hospital. These institutions are signalized by the aspect of reform of character as much as by that of punishment. The law does not forego its claim to deal with prostitutes as criminals; but religion steps in and deals with them, and tries to make them penitents. By the various names of Magdalene Asylums, Lock Hospitals, Penitentiaries, and such like, these houses of correction are known, and the objects common to all are, by sobriety, cleanliness, and medical assistance, by a regular series of labour, by solitary confinement during the intervals of work, and by religious instruction, to preserve and amend the health of the offenders, to inure them to habits of industry, to guard them from pernicious company, to accustom them to reflection, and to teach them the principles and practices of moral and social duty. Institutions like these are within the bounds of law, are approved by reason, and sanctioned by religion. Institutions, with attributes like these, are schools or churches as well as jails. But to aggregate prostitutes in a public building and give them public support, where no such attributes hallow the scene, is to constitute neither a church, nor a school, nor a jail, but a brothel.

Another letter by way of supplement was afterwards forwarded. In this, I took occasion to quote the recorded opinions, or, in one instance, oral testimony of Lord F. FitzClarence, Sir Bartle Frere, General Jacob, Colonel Edwardes, and Sir John Lawrence, on the subject in question, and this weight of authority was thrown into the scale which bore the condemnation of the Lock Hospital system. Lord F. FitzClarence, through the Adjutant General, announces his views thus, "I am directed to

intimate that, after giving the whole subject his best attention, His Excellency concurs with his predecessors in command of the Army, that police measures for preventing the infection of the soldier with the venereal disease cannot be carried further than therein ordered [this alludes to orders for expulsion] without involving the certain degradation and oppression of many women of respectable character and occasioning other evils, which, in His Lordship's opinion, would be much greater than that which it is the object to remedy." General Jacob, amongst other remarks, makes the following: "I would not interfere with these women in any way, and although it might be good policy to provide dispensaries or hospitals, to which such persons might resort if they chose, there should be none specially set apart for them." "The proper and only wise method of reducing this disease is to improve the condition,—the state of moral being,—of those who resort to these women. Coercion of every kind always increased these evils. Moral forces alone are of any value." He adds, speaking of the Sindh Horsemen: "The elder, graver, and better part of the soldiers, seven-eighths of the whole number probably have their families here, and do not resort to public women, except when they employ them at nautches, &c. &c." Colonel Edwardes and Sir John Lawrence both concur in the propriety of expulsion of prostitutes, and signalize the restriction on marriage amongst the English troops as a great evil and hardship, and assert that married men are the better soldiers, and women and children no impediment in time of service, as they are left in Cantonments.

To this weight of authority, I would add one or two facts. The fourth Company of Reserve Artillery at present stationed here (1858), I have had charge of for fourteen months, and the strength, inclusive of men attached from other companies at Hydrabad and Shikarpore, has been the average of 107 men. Of primary cases of venereal affection, there have been treated 13, which by calculation gives for 1000 men per mensem for one year 111 cases. I have had charge also of the Depôt, 1st Fusiliers, for nearly 19 months. Of these months, I omit the first, as it represents the whole Regiment not the Depôt. The strength for these months is 95, as in that time about 150 recruits passed

through. The primary venereal affections in these 18 months are 20; which by calculation would give per 1,000 men per mensem in the year, cases 140. The mean of the Artillery and Fusiliers is 125, which divided by 12 for 12 months, gives an average of admissions per mensem in an European Regiment, 1000 strong, of $10\frac{1}{2}$ nearly. I served for five years with a Native Regiment, the 1st Grenadiers, an abstract of the returns of which, I have now before me. The strength was 781 per annum, the number of primary venereal affections amongst the privates (there was not one amongst the Native Officers) was 77, the annual average was therefore 15. This by calculation for 1,000 men gives admissions 19 per annum, and per mensem $1\frac{7}{12}$. When we compare therefore the condition of an European Regiment and of a Native Regiment in this matter of venereal infection, the Native Regiment appears to a greater advantage by five times over, than the European. And it will be extremely difficult to find any satisfactory explanation of this deplorable fact, other than that in the European Regiment, marriage is restricted and widows unkindly used; whereas, in the Native Regiment, marriage is free, and the Native soldiers' family generously treated.

It was already stated that these representations were followed by the destruction of the ill-featured institution, which was set up here. But whether its congeners at Poona and Belgaum, shared the same fate, has never, I believe, been made public. If these exist, the reasons urged are as applicable to them, as they were pertinent to the instance which gave rise to them. But the subject would be imperfect indeed, if we stopped here. The system is called for, it is not said wisely called for, because of the deep pervading power of the sexual passion, and the evils which arise from its promiscuous indulgence. Now the wisest law that ever was promulgated on this subject, the only one which deals a deadly blow at the heart of the vicious and debasing crime in question, is the simple one—"Let every man have his own wife, and every woman her own husband." How complex, how difficult, how unavailing all other legislation on the subject except this! And this how plain, how obvious, how admirable! This law, however, has been set aside. There

has been wailing in families, and immorality in public places, because this law has been set aside. The British public, though late, has recognized the fact, and sympathizes with those who are sufferers by it. The Government will not overstep public feeling but concentrate its action, and gain merited applause if it lends ear to a law which should never have been violated. But the marriage of the soldiers will entail additional expense on the public? If it be so,—and this may on a comprehensive view be doubted,—let the public know why, and it will not complain. Besides, does any one think that the pay of the soldier is ever to continue at the venerable 13 pence a day? Sir Archibald Alison has publicly stated his opinion, that the soldier's pay ought to be 20 pence a day. With changed times, is everything to change but the soldier, his pay, his prospects, his happiness? I conclude then that these two principles, of the repression, not recognition of prostitution; and of the permission, not restriction of marriage, amongst the European soldiers in India, indicate clearly what is needed in the way of Christian and public duty, and what is best for the elevation of the soldier, as respects morality, health, happiness, and efficiency for the public service. And I add my conviction that this, the true remedy, bounty to the soldier, not the prostitute, will, whenever applied, declare itself in its simplicity, perfect propriety, efficiency for the end desired, and the many priceless advantages it will bring in its train.

In the year 1851, it occurred to me to be engaged, in conjunction with others, one of them the superintending Engineer of the Province, in devising the plan of a Lunatic Asylum for Kurrachee. It then appeared how vague were existing opinions on the subject of space in buildings, and how little information was available from any source to satisfy the enquirer. The subject occupied attention. Sir Charles Napier had wisely insisted on having hospitals and barracks greatly larger than those heretofore in use; but the principle or rule, to guide to the determination of what the actual space should be, was not to be found. Sir Charles particularly desired height, and had no better reason to assign for the preference than that the doctors would no longer be able

to stuff their patients into the corners of the hospitals. This was sometimes jocularly, or perhaps seriously, met by the statement, that we had a tall column of air in dead wells, yet the air sometimes was fatal to those who descended into them. Dr. D. B. Reid had recommended 1,500 cubic feet per man, but this, almost by common consent, was declared an extravagance. In April 1852, it became my duty to make a special report on the jail at this place. The space allowed for patients was very small, and seemed to have been really productive of very bad effects. It was remarked—"It has not been hitherto sufficiently considered that a man in 24 hours must breathe 300 cubic feet of fresh air or sicken. Were he confined in a space of this extent, without the access of new air, the process of vitiation must commence with the first respiration, and the man could not live in health and vigour for 24 hours. Hence the necessity of spacious accommodation, and of free ventilation, without due observance of which health cannot be maintained, disease will be aggravated, and life itself destroyed. In Europe, a space from three to five times exceeding that mentioned, or from 1000 to 1500 cubic feet, together with good ventilation, is judged suitable as an allowance for each individual, in any establishment permanently occupied, and the air of which is liable to constant vitiation. And it might be easily shown that the conditions obtaining in hot climates render desirable an increase and not a diminution of this allowance." This, however, did not escape without what was meant perhaps as correction, but looked like animadversion. It was observed—"In reference to Dr. Grierson's special Report on the Kurrachee Jail, the Board direct me to remark that, though the number of cubic feet of air necessary to be respired in 24 hours by a single individual be stated at a moderate amount, they are of opinion that officer rather exceeds when he talks of 1000 or 1500 cubic feet, together with good ventilation, being considered suitable as an allowance for each individual in any establishment permanently occupied, and the air of which is liable to contract vitiation. At least in practice it is not so, for even in the Metropolitan Hospitals of London, Dublin, and Edinburgh, in the Provincial Hospitals of all England, and in the General Hospitals, Naval and Military, of

the British Government, the allowance is under 1000 feet; while to British soldiers in barracks at home, and in temperate climates, the allowance is 450 to 500 cubic feet, increased in tropical countries in Hospitals to 650 or 700 feet. 1000 feet in Barracks and 1500 in Hospitals, is as much as could be desired for each European even in the Tropics." The force of the concluding sentence here, it is presumed, depends on the assumption that the want of the Native in respect of air is less than that of the European. Natives generally want less, as pay for instance, and possibly they may want less atmospheric air; but the fact, I think, has not yet been determined by experiment. This recusancy on the part of the Medical Board is not to be wondered at. Opinions grew very slowly on this subject, and perhaps have not yet reached their maturity. Lavoisier, whose merits are so well known, in the end of last century, pronounced the air required in respiration for one man in 24 hours to be 120 cubic feet. Sir G. Blane, in the beginning of the present century, named 600 cubic feet in Hospitals as a minimum, and thought 1000 not too much. Dr. Bostock in 1826, quotes with approbation this conclusion, the former had embraced. In the year 1833, Begin* assigns 20 cubic *mètres* as the volume of air calculated for fever cases in Hospital, and the equivalent of this in English cubic feet is a space of 700 cubic feet; but when he gives the dimensions which should characterize the hospital he approves of, he seems to raise to 1000 cubic feet this amount of space. About 1844, Dr. D. B. Reid recommended 1500 cubic feet, and there opinion in England seems at present to halt. However, the authorities of King's College, London, did not adopt that standard, but allow for each patient a minimum of 1800 cubic feet, and a maximum of 2400 cubic feet. Besides this diversity and gradual development of views, confusion of thought was occasioned by the connection subsisting between space and ventilation. In the progress of knowledge events lag behind. Principles always precede their practical application, and even when more enlarged notions of the necessity of increased space began to prevail, there were very strong objections entertained

* In the *Dictionaire de Médecine et de Chirurgie Pratique*, under the article "*Hospital*."

to pulling down small, and then erecting new and suitable, buildings. The intention of this increase, it was allowed, was to give fresh air; and this intention it was sought to accomplish not by increase of space within, but by means of better ventilation from without. Yet no attempt was made to determine in what relation space and ventilation stood to each other. Again, in India it was often said, rules like these apply in Europe, where buildings are shut up on account of climate, but with us buildings are almost always open, are thus ventilated at all times, and the increase of space demanded in Europe is not requisite. To this argument no effectual answer was forthcoming.

It was in the same year (1852), that I was under the necessity of considering the question again. The occasion was this. I was called on by the Medical Board to report my experience and opinion of the station of Colaba as affecting health, and especially the health of European troops. The subject of space in barracks and accommodation fell thus to be specially adverted to, and it was sought to attain some definite notion, which should assign a just limit to precepts hitherto apparently arbitrary.

In my reply, therefore, in October 1852, I wrote thus—"Accommodation is highly important for troops. Besides protection from the various changes of the weather, space and ventilation demand more attention than they have hitherto usually received. The amount of space allowed to troops on Colaba is not known; but though recently enlarged, it may be presumed, if one judges by the views very prevalent, to be defective still. It cannot be inopportune at any rate to say a few words on the subject. Pneumatic chemistry seems to have been long cultivated before chemists saw the relation it bore to space in dwellings and ventilation; and the mode of estimating these, which is perhaps the best, is of very late introduction. Dr. Bostock, who criticises with great care the experiments on respiration made before he published, was aware of the relation alluded to; but contented himself too easily by giving an approval of Sir G. Blane's estimate of 600 cubic feet of space for every man. This allowance is about twice the amount of air a man respires in 24 hours. Dr. Reid, when he published about eight years ago, recommended from three to five times the amount in cubic

feet of the air respired, that is, from 1000 to 1500 cubic feet. And it has been very lately announced, that the Hospital of King's College, London, is to have wards to contain 14 beds with a minimum of 2,400 cubic feet for each patient. These numbers represent 9 times and 12 times respectively, the amount of air respired in 24 hours. It will give perhaps a clearer conception of these differences to state, that a space $8\frac{1}{2}$ feet in length, breadth, and height, contains a little more than 600 cubic feet. Ten feet in the dimensions mentioned contain 1000 cubic feet; twelve and one-sixth in the same way give 1,800 cubic feet. For 2,400 cubic feet the space must measure, in the three dimensions nearly $13\frac{1}{2}$ feet, and for 3000, almost $14\frac{1}{2}$ feet. Two modes have been adopted for estimating the space required for each individual. Finding the amount of air respired, it has been multiplied a given number of times, and the product according to the multiplier assumed is the space required. Thus a late writer* states as follows:—"In the process of respiration a full grown man draws into his chest about 20 cubic inches of air, only one-fifth of this is oxygen; and nearly one-half of this oxygen is converted into carbonic acid. Now, allowing fifteen inspirations per minute, for a man, he will vitiate about 300 cubic inches or nearly one-sixth of a cubic foot of atmospheric air, and this by mingling, as it escapes, with several times as much, renders at least two cubic feet of air unfit for respiration." This estimate gives air respired in 24 hours 250 cubic feet; and this multiplied by 12, the number stated, viz. $\frac{1}{6} \times \frac{12}{1} = 2$, is 3000 cubic feet. The other mode is to find the amount of carbon respired in 24 hours: to calculate the oxygen this requires to convert it into carbonic acid, and to determine from this the quantity of pure air necessary to be respired in order to supply the requisite amount. Thus the same writer says—"From a comparison made by Professor Miller of King's College, of the results of numerous experiments, it appears that a man of ordinary stature consumes in the course of 24 hours 9 oz. troy of carbon; that the heat generated is sufficient to boil away 8 lbs. of water; that the consumption of oxygen in this process is equal to 24 oz., or 19·4 cubic feet; that the quantity of air vitiated amounts to 97·2 cubic feet, and the product in

* Tomlinson on Warming and Ventilation, London, 1850.

carbonic acid to 33 ounces." By the quantity of air vitiated here is meant the amount from which the oxygen is wholly withdrawn, which is just five times the oxygen consumed. But the quantity of air respired is twice as much; for only one-half the oxygen inspired is consumed during each respiration. The air respired, therefore, by this mode of calculation, is nearly 200 cubic feet in 24 hours. Now 9 times this amount is 1,800 cubic feet; and 12 times the same amount is 2,400 cubic feet; and these are precisely the results as they were most probably the data used in determining the construction of the new Hospital of King's College, and they approximate pretty closely to those found by the other method before explained.

"These are the rules for guidance on a subject scarcely yet fixed on settled principles, and which when better understood will create a demand for yet greater space in buildings. It remains, however, to inquire how far they are consistent with propriety and suitable to the end in view. The carbonic acid, being the most abundant of the noxious products thrown off in respiration and most easily measured, is taken as the basis of the calculations regarding space and ventilation. The mean amount of carbonic acid in ordinary atmospheric air is about $\frac{1}{2000}$ or ·0005. The amount in air expired is about $\frac{1}{12}$ or ·083, and in air vitiated to this degree combustion ceases, and plants and animals cannot live long. Practically, then, it may be assumed that respired air contains $\frac{1}{10}$ or ·1 of carbonic acid, and this must be diluted ten times to make the air safe. Thus $\frac{1}{10} \div \frac{10}{1} = \frac{1}{100}$ or ·01, and this again divided by 10 or $\frac{1}{100} \div \frac{10}{1} = \frac{1}{1000}$ or ·001, gives the amount of ventilation needed to reduce the air to that state of purity that only $\frac{1}{1000}$ more of carbonic acid should be added to the air; when it would be represented by ·0015 instead of ·0005. Observing this rule, and taking 300 cubic feet to represent the quantity of air respired in 24 hours, to dilute it ten times, it must be mixed with ten times the same bulk, or converted into 3000 cubic feet, the space to be allowed for one individual. But if it is wished to keep up a pure air, it must be mixed with ten times this bulk again, or 30,000 cubic feet, which

shows the ventilation needed to maintain an atmosphere nearly pure. In other words, there must be admitted into the space of 3,000 cubic feet nearly 21 cubic feet per minute of fresh air by ventilation, if the individual confined in it is to breathe an atmosphere which shall contain only $\frac{1}{1000}$ part more of carbonic acid than the air he breathes originally contained. Or again, 300 cubic feet, 3,000 cubic feet, and 30,000 cubic feet, mark the requirements of one individual, in 24 hours, for respiration, space, and ventilation, respectively."

These are the conditions necessary to maintain a pure air according to the data made use of. There are, however, other facts to be adverted to, which, wherever they exist, and some of them always exist, render still more imperative the claims put forth for space and ventilation. These it is not needful to illustrate at length. The enumeration of them will suffice. They are—a humid air, high temperature, the privation of oxygen in respired air, as well as and nearly equivalent to the vitiation by carbonic acid gas, and lastly the watery vapour laden with offensive animal matter exhaled from the skin and lungs during respiration. The last of these especially is important. It has been stated that "the odour of the air at the top of the ventilator of a crowded room is of so noxious a character that it is dangerous to be exposed to it even for a short time. If the air be passed through pure water, the water soon exhibits all the phenomena of putrifactive fermentation." To the same also is due much of the effect described in the following quotation:—"In the houses of the poorer classes in Russia, where the windows are single, and a number of persons occupy a small stove-heated room, a thick icy crust forms on the inside of the windows during frosty weather, arising from the condensation of the breath, perspiration, and the aqueous fumes of candles, and of the stove, &c. When a thaw comes on, the icy crust is converted into water and a deleterious principle is disengaged, which produces effects similar to those arising from fumes of charcoal. Persons so affected are immediately carried into the open air, and placed in the snow, with very little clothing, the temples and the region of the stomach are well rubbed with snow, and cold water is poured down their throats and the friction is continued until the livid

hue of the skin disappears, and the natural colour is restored." With these effects we may contrast those of a purer air. For instance, a manufacturer puts a ventilating fan in his factory to remedy the evils of a highly-vitiated air. The result is, the people apply for higher wages, because their appetites are keener, and they require more food. The Veterinary Surgeons recommend ventilation for stables, and the annual saving to the British Government is £10,000 per annum. The effects of condensed air are very similar, and perhaps for the same reason, that more oxygen is breathed, under circumstances favourable in other respects, to the healthy functions of the body. There is felt a pleasant sensation in the chest, there is increased vigour of body and of mind with improved condition of some diseased states, and more effective performance of some healthy actions.

These considerations, with others, which need not be adduced, occasion reasonable apprehension, that many evils in Barracks and Hospitals accrue to the men from want of space and ventilation. And if, in any place as in Colaba, other injurious influences are also at work, the respective effects of each separate cause are aggravated by reciprocal reaction.

Passing on now in the progress of events, and the history of opinion, I extract from a public document, namely, "Budget of Public Works of the Presidency of Bombay, 1857-1858," dated April 15th, 1857, the following—"The desirableness of establishing some general rule for fixing the amount of space to be set apart for each man in the hospitals of European troops of this Presidency was, in the beginning of 1853, brought under the consideration of Government by the late Lord Frederick Fitz-Clarence. His Lordship considered it of great importance that a fixed rule on this subject should be adopted and enforced, in order to prevent over-crowding in hospitals, and also to enable the medical authorities to know at all times with correctness the amount of suitable accommodation available for troops."

"After consulting the Medical Board on the subject this Government, in accordance with the Board's recommendation, decided that 1800 cubic feet per man should be made the standard in the hospitals of the Bombay Presidency."

"Subsequent to the adoption of the above standard, the Commander-in-Chief pointed out that nearly every European and Military Hospital in this Presidency was deficient in accommodation and required to be considerably enlarged. In this opinion, which was supported by the Medical Board, the local Government fully concurred."

With the affirmation of this rule, if it may so be called, which indicates a slight advance in the opinion of the Medical Board upon that before alluded to, the matter rests. Lord F. Fitz-Clarence died in 1854, and in 1857 the Public Works were suspended;* and in this breathing time it is important to inquire whether the decision come to by Government be adequate to the necessity of the case. In the first place no mention is made of barracks, and it is presumed the space of 1,800 cubic feet was not meant to be allowed in barracks. If then this amount of space be barely sufficient for hospitals and less be allowed in barracks, then, to say nothing of ordinary occasions, whenever the weather or other cause constrains men to occupy the barracks more than usual, or a greater number of men than usual are put into barracks, the space is too little, and health must suffer. But for hospitals even, the space is insufficient. Did this opinion rest simply on my own decision of the question, however firmly and in good faith I might hold it, still I might hesitate to give it prominence; but it happens that I can adduce authority which will command respect. It was shown before that space and ventilation are inseparably connected, and it would not be possible to give dimensions to a building, as a habitation for living beings, which should obviate the necessity of ventilation, in other words, renewal of the air of the interior, which supplies the inmates with air for respiration. It is evident also that for health in buildings just in proportion as space is small, so is the need of ventilation greater. Now when 1,800 cubic feet is decided on as the space in hospitals, there is no provision for ventilation, and no one is in condition to say, that ventilation is duly performed. It is left to the operation of doors, windows, and some few apertures in the roof, or elsewhere, and to the action of the outer air, which of course daily, perhaps hourly, varies, as the temperature, force, and direction of the winds vary.

It cannot be denied then, that where ventilation is so uncertain and may altogether fail, as in calm weather it must, the greatest limits of space are very necessary. And it will appear yet more evident, when the matter is put in another light. In the *British and Foreign Medico-Chirurgical Review* for April 1860, in the article on the Site and Construction of Hospitals, when the reviewer treats of ventilation, he says—"The French Hospitals contracted for a supply of 2,220 cubic feet of air per bed per hour;" but,—"To give," says Dr. Sutherland, "the air of a ward the highest degree of freshness, the amount of air passing through it should be at least double the amount required by the French Hospital contracts, or about four thousand cubic feet per bed per hour."

We shall suppose, then, as we have reason to do, that the wards here spoken of allow 1,000 cubic feet per man; let us next convert the hourly supply into that of 24 hours, which conversion gives for the French hospitals 53,280 cubic feet per diem, and for the proper amount, nearly double, as Dr. Sutherland says, 96,000 cubic feet per diem. These sums bear to 1,000, the cubic space per man, the proportion of 1 to 53 and of 1 to 96; that is, in the former case the air must be renewed fifty-three times, and in the latter ninety-six times per diem. But what it is important to observe is this, that were the space in the French hospitals doubled, or made 2,000 cubic feet instead of 1,000 cubic feet, then, though the renewal of the air be half the number of times only, yet the purity of the air in either case would be the same. And the reason is not obscure, for the air of the smaller hospital is contaminated twice as much and requires twice as much ventilation, that is, renewal, to maintain the same degree of purity. Observe again, for confirmation of this fact, that it is the same amount of air in either case which is needed for ventilation. The difference consists only in the rapidity, or number of times, with which air equal in amount to the contained air, is transmitted through the hospitals. Now if the hospital with the space of 1,000 cubic feet per man, requires 96,000 cubic feet of new air per diem per man, or necessitates the renewal or change of the air ninety-six times, the hospital with space per man of 1,800 cubic feet requires only 53,333; for as 1,000 : 96,000 :: 1 : 96; and as

1,800 : 96,000 :: 1 : 53,333; and what immediately concerns the result of this investigation, as 3,000 : 96,000 :: 1 : 32. It follows, therefore, that the hospital with space of 1,000 cubic feet per man must have new air ninety-six times a day; that whose space is 1,800 cubic feet, fifty-three times a day; that whose space is 3,000 cubic feet only, thirty-two times a day. The first is possible only by the aid of strong mechanical means; the second would require probably less expenditure of force, and would not be independent of it; and the third only approaches the conditions, which would probably make natural spontaneous ventilation effective to maintain the purity of the interior air. The conclusion is that for Indian Barracks and Hospitals, if they must be built, and the latter it is presumed must be built, 1,800 cubic feet, unless in conjunction with artificial ventilation, is greatly too little; and that two alternatives offer themselves to remedy the defect, either to enlarge the space, or to employ artificial ventilation.

It has been perhaps noticed, but may with propriety be pointedly referred to, that provided, as is probable, Dr. Sutherland's calculation proceeds on the *datum* of a space of 1,000 cubic feet per man, the conclusion he comes to agrees well with that which was stated in the foregoing part of this paper; for 1,000 × 96,000=96,000,000 differs but little in such a calculation from 3,000 × 30,000=90,000,000. Add but 2,000 cubic feet to the ventilation in the latter case, that is, make the 30,000 32,000, and the result is precisely the same. This is the more satisfactory as the aim of both calculations was identical. This design he announced to be—"To give the air of a ward the highest degree of freshness;" and in the foregoing pages, it was said,—"There must be admitted into the space of 3,000 cubic feet nearly 21 cubic feet per minute of fresh air by ventilation, if the individual confined in it is to breathe an atmosphere which shall contain only three times more of carbonic acid than the air he breathes originally contained." The only sound principle in the question is the maintenance of a pure air. Data may differ, calculations may reach the same result by different ways, but if the ultimate end be not a pure air, nothing is right—nothing thoroughly effective. And it is to be borne in mind, when the means to accomplish this end are considered, that space and

ventilation bear an inverse ratio to each other, that as space increases ventilation becomes less, and that they may reciprocally bear that relation to each other when ventilation shall become easy, or perhaps natural and spontaneous.

One who reflects carefully on these things, who sees the direction they point to, and would wish to realize in practice facts of speculations like these, would be wholly destitute of foresight, if he did not anticipate an objection which will be immediately raised. It will be said, the increase of space you require is enormous; the expense would double that of the erection of the present hospitals and barracks. This view of the question may be admitted. Probably indeed the truth of it cannot be disputed. But it may be urged that this view presents but one side of account. There is another, which it is the duty of professional men to try to exhibit. Against the expenditure in money, we have to show the restoration of lessened vigour, and vital energy; the removal of languor, lassitude, and discontent, and the diminution of impaired health, vitiated moral tone, of disease often, and death not seldom, the results not obvious to sense, undeniable in reason of the contaminated air of barracks and hospitals. But who shall estimate in money value the difference between an army moral, and effective at all points, and one debased in character, and deteriorated and inefficient in physical condition? There is yet another side of this question, which appeals to the sensibilities of men. We demand for men everywhere, we judge imperative for those whom we would maintain in health, good and pure water, good and clean food, and we are sympathized with, and it is considered a great evil when matters are otherwise, and would be regarded a monstrous, an intolerable grievance, to insist that impure and bad water, bad and impure food, should be made use of. Here, where matters are more patent to observation, and better understood, the state of feeling corresponds at least in some degree to the necessity, and it provides against, or exposes where they exist, and removes, evils of this description. But air is more necessary to man than even food and water; and pure and good air is as imperatively wanted as pure and good food or pure and good water; nor is it in reason in any degree less unseemly,

that men should content themselves with, or be constrained to submit to, impurities of the one kind, any more than to those of the other. If besides, the injury be taken into account, it is perhaps just as great or greater in the instance of impurities of the air than in those of food and water. The harmony of the being and constitution of man with the physical conditions of the world which surround him is so perfect, that nature cannot be violated by ignorance, or artificial arrangements, without injury, loss, and embarrasment; and we may safely repose that confidence in that harmony which shall enable us to observe it as a rule of duty; and if, in following it out in this instance, the soldier receives the benefit of what best promotes his well-being, as a man and as a moral and religious being, and amongst other things of the purest air, the result it cannot be affirmed will be inexpensive. The expenditure, however, will be the most profitable, the only suitable, well-laid out in performance of a solemn duty, and in maintenance of the efficiency of that force which gives security to the common interest, upholds the throne, maintains the administration of justice in mercy, and repels, if that evil day should come, foreign invasion.

In the year 1843 I served on a Committee at this Station,* the object of which was to report on the conditions prejudicial to health existing in Cantonments, and to point out remedies. The analogy of this climate to that of the Persian coast was pointed out, the existence of fever inferred as probable, the peculiarity of this place in the limited quantity of rain was dwelt on, and the necessity of peculiar care and assiduity in sanitary matters enforced from this consideration. The reason of appointing the Committee was the prevalence of sickness at the time. A year of very great sickness and mortality followed elsewhere in Sindh, and the sickness which existed here was, perhaps on that account, less observed, and little or nothing was effected for cleansing the cantonment. When first occupied, Kurrachee was esteemed, and reported by Dr. Cahill,† an intelligent observer, as peculiarly healthy. My own note of the place, when I first landed here in November 1839, was,

* Kurrachee.

† Transactions Medical and Physical Society, Bombay, vol. 2nd, p. 210.

"Kurrachee has now been occupied for upwards of twelve months, and has acquired, though I think hardly with justice in so short a time, a reputation of peculiar salubrity." It was occupied in the year 1838. It lost this character, as is evident from the formation of the committee before alluded to, but it was not till 1846, that it was signalized by an outbreak of cholera sudden and terrible, which gave it a bad eminence never to be forgotten. Out of a force of 6,626 men bearing arms, almost in equal numbers, Europeans and Natives, including women, children, and native followers, the deaths in different hospitals were 915, out of 1841 attacked by the disease, between June the 14th when it made its appearance, and July the 11th when it ceased. In four days, from 15th to 18th inclusive, there were admitted on an average 203, of whom on an average 110 died daily. Two regiments suffered in an especial manner. In Her Majesty's 86th Regiment, out of 434 seized, of whom were 18 women, 5 children, and 1 native follower, 258 died, of whom 15 were women, 4 children, and 1 native follower. In the 1st European Regiment (Fusiliers), there were 252 admissions, of whom 6 were women, 6 children, 19 native followers; and of these died 103, being men 83, women 5, children 3, and native followers 12. Cholera had prevailed sporadically for about 12 months previous, but before that time also had prevailed, but never with such dread severity. Now passing all other circumstances without notice, and some of them are not unimportant, such as the dearth and scarcity of provisions at the time, it is very desirable that it should be distinctly known, as Dr. Arnott informs us, that the state of camp and neighbourhood at that time was most obnoxious, and as much neglected as if medical police had never been heard of. In No. II., *New Series of Transactions of the Medical and Physical Society of Bombay*, page 182, published in 1853, Dr. Arnott mentions sources of disease common to all the Regiments then at the station, and then he says: "But there were others peculiar to the position of the camp of Her Majesty's 86th Regiment, and the Bombay Fusiliers. They lay still further to the eastward, or leeward of the other lines, and of the Suddur Bazar. Between the latter and these camps was a large piece of bare waste ground,

where all dead animals, the cleansings of necessaries, the sweepings of streets, and where in fact most of the filth and offal of the camp was deposited. The accumulation of putrid animal and vegetable matters was enormous." He states that the Fusiliers had been too long encamped on the same ground, that the tents were crowded, and the ventilation little attended to, and then adds: "Under these circumstances, there was certainly enough if not to engender disease at least to encourage its propagation and extension. And I have always viewed them as accounting for the intensity of the attack in these two regiments." Had this fact been known to Dr. Carpenter,* he would have found in it, it is presumed, a more efficient cause of this disaster than even previous fatigue, and over-crowding, which no doubt, the latter especially, were very prejudicial. His analysis of the features of the case omits this scandalous impropriety, and is somewhat inaccurate in other particulars; but his conclusion, that corrupted air gave intensity to the malignant scourge, is only more confirmed by the fact judiciously recorded by Dr. Arnott. Kurrachee in 1839 was healthy. In 1843 fever prevailed severely. A peculiarity elsewhere observed by others, in situations where corrupted air infested the locality, or the antecedents which generate it abounded, was very frequent in Kurrachee in 1843. It was experienced amongst others by myself. At meals principally, or immediately after, without much warning, uncontrollable nausea and vomiting suddenly appeared and quickly subsided, without other obvious derangement of health, previous or subsequent. In 1846 the unhealthiness of the place culminated as has been related; but frequent sickness and cholera in milder form prevailed afterwards, especially in the years 1851 and 1852. In the former year, in April, by the foresight and energy of Sir Bartle Frere, then Commissioner in Sind, a committee of conservancy was formed, and of this committee, in November of the same year, I became secretary. The appointment of this committee was the first step to sanitary improvements in Kurrachee. In less than one month from its formation, the resolution for the erection of furnaces was passed, at first only experimentally; but

* *Human Physiology, Ed. IV.*, 1853, *pp.* 549—50.

the existence of many of these erections now gives a feature peculiar to itself, to Kurrachee, as respects the outskirts both of the town and cantonments. In 1852, the practice of the inhumation of the waste and filth of the jail, was carried out by the committee, a practice which to this day beneficially continues. The operations of the committee were limited and embarrased by want of funds; for available resources were yet small, and all the suggestions of the committee could not be immediately embodied in the material accomplishment of their designs. It was therefore reserved to Sir John Hall, C.B., on his visit to this place, as Deputy Inspector General, in the early part of the year 1853, to point out, as he did most forcibly, the unreformed nuisance which had existed since 1846, and shed its baneful influence ever since, though not with such awful virulence, as marked the calamitous cholera of that year. By his report the interest of Lord F. FitzClarence was roused, and thus a new and happy impulse was given to sanitary improvements at Kurrachee. By additional furnaces, by increased establishment of those employed in the cleansing department, and by better supervision, the most prominent evils were completely removed, and a system set a going which rendered the reccurrence of them impossible. It cannot be said that all is even now as it ought to be. But there is a readiness to recognize defects, a great contrast to former times, which defects consist principally in the yet too limited establishment, and which, there is reason to hope, will be removed.

But little interest, it may be thought, attaches to a narrative like this; perhaps even it may be judged by a severe censor, that through partiality, and an overweening estimate of local concerns, it is sought to give undue prominence to what does not merit deliberate consideration. Let us, then, revert to the facts already noticed. At first Kurrachee was healthy; gradually the health of the place deteriorated; and the year 1846 makes it memorable as the theatre of one of the most calamitous epidemics recorded in the annals of medicine or of history. Nor was it till after the year 1852, that the place enjoyed an immunity from yearly attacks of fever, and often of cholera. But this is exactly the era of the sanitary reforms; and the removal of obnoxious practices and nuisances is precisely

simultaneous with the cessation of epidemic disease. No one accustomed to investigate evidence can consider the history and connection of these facts with due care, and avoid the inferences that neglect of sanitary police and the presence of disease, and cessation of disease, on the other hand, and attention to sanitary police, which they fully establish, stand in this case, in the relation of cause and effect, that it is not hopeless to set limits to the most virulent diseases, and that were due precautions, such as science indicates and experience confirms, had recourse to, life would be saved, much misery averted, and climates, without changing character, would lose the terrors and dangers which environ them, which impair the enjoyment of life, often curtail it, and add incalculably to the expense of the Government of the country. It must be admitted that this year, contrary to expectation, cholera visited the place. It advanced from the eastward, invaded several villages, appeared at the harbour at Keeamaree, in the town and jail, and lastly in cantonments. The incursion, however, was brief, the numbers attacked limited, and the deaths few absolutely, and even more so relatively to the actual amount of the developed disease. There have been then seven years of exemption from the disease with diminished sickness in other respects, and in the eighth year, an attack which one cannot but characterize as mild, and this, though it qualifies, yet cannot set aside, and scarcely, when we make allowances for other circumstances, invalidates the general result.

This result certainly merits attention as an instance of the effect of sanitary measures, and the good which ensues when they are pursued on an adequate scale. And as before hinted, this result, confirmed by experience, is indicated also by science. The geologists, in some of their sketches, picture to us the naked crust of the earth; then the disintegrated mountains; next the decomposition of the fragments, thus freely exposed, by agencies which operate on them. Plants spring up after this; and the mixture of organized products with the inorganic, transforms the sandy soil into fertile mould; increase of vegetation goes on; and lastly animals appear upon the scene. Now, in the earlier stages of this process, and in all that we recognized then in the

inorganic constituents of the earth and air, there is found nothing noxious to the life and health of animals. Organization afterwards gives rise to new compounds and new products, and when these, as waste refuse material, are accumulated in neglected masses, in the process of reduction to simpler combinations, the result of ordinary chemical affinities, when cessation of vitality has left the organized structures an easy prey to them, gaseous compounds are formed, prejudicial to health, and which are capable, some of them, of a power passively or more actively to extinguish life. Connected with this subject, in the report on Colaba, I had occasion to observe: "Earth, air, and water, though viewed very differently in ancient and modern times, are still the great elements, which influence man's condition and development, and the health he enjoys. They are simple, harmless, beneficial in themselves. The necessities of vegetable and animal life, the action of living properties, and the affinities of organized products, resolve them into new combinations, and some of these are highly injurious. It is the object of science to disclose and unveil all evils of this kind, and of science practically applied to obviate and remove them; and a generous confidence in the harmony of man's condition with his duties and enjoyments, ought to make us slow to believe that any natural evil is beyond the control of science rightly directed, or without a remedy, of which only lack of industry or of sagacity may obstruct the discovery and the application. Nor when we pass from the more tangible objects, comprised under these divisions, to the consideration of the imponderables, heat, light, and electricity, is there found any fact which renders this judgment of nature and of science, which has been announced, visionary or untrue." Man received commandment to increase, multiply, and fill the earth, and subdue it; and more especially in regard to that portion where his lot was cast, to dress and keep it; and it is evident, that his success in compliance with the former part of his obligation, is dependent on his diligence in the execution of the latter part of his office. Nor is this true simply as respects subsistence, but as respects health and well-being also. He dresses the earth for food, but if he neglects to keep it, to return to it what he takes from it, the accumulated waste materials

will accuse him, and punish him for neglect, and the earth itself will fail to yield its increase. Thus uncultivated marshes generate ague, torment and kill men; but drained and cultivated, they are beautiful, healthful, and produce food for man and beast. The waste of animal matters, recrementitious products of the arts, or decaying products of organization, left to diffuse the noxious gases that arise from them into the air, contaminate it, and affect the health, longevity, and productiveness of man; teach him, if he will hear, how he has neglected his duty to the earth, and himself, and warn him to dress the earth and keep it. Towns and camps, where medical police has failed to remove noxious matter, have often afforded proofs and illustrations of this hurtful ignorance and prejudicial neglect of duty. Kurrachee was an instance of this kind; and though, at this place, the condition of agriculture, and the prejudices of the people in great measure, rendered it impossible to return immediately to the earth, for fertilizing purposes, the waste products of busy industry and civilization, yet the partial compliance with the great primitive commandment carried out by the inhumation of noxious substances and their assimilation with the soil, and the dissipation of their elements by incremation, and their transmission through the air, to feed the vegetation they should come in contact with, even these imperfect modes of freeing the station from impurities have been attended with results most evident, efficient, and satisfactory.

The chemist takes a small piece of rock, submits it to his refined analysis, and ascertains with precision the ultimate components of it, and their respective proportions. He knows then, without further research, that he can affirm correctly what are the ingredients of the mountain from which the fragment was taken, of the chain of mountains to which the first belongs, of other chains possibly, which stretch into other countries, or even of those, perhaps, which exist in countries divided by the ocean from that which afforded the specimen subjected to his analysis. And however this may be, he is at least certainly in a condition to declare, whenever a substance, which possesses the same sensible and physical properties, as that examined by him, offers itself to his notice, that the components of it are identical with those of

the portion of rock, the constituents of which he had determined. Universally in nature, the same results are yielded by homogeneous substances when chemically analysed. The same universality belongs to experiments in physical science. When Pascal found that the column of mercury varied in height, when measured at the bottom, middle, and top, of the *Puy de Dôme*, he felt quite sure that the same result would be found on any other mountain by any other philosopher who should make the experiment. Uniformity of antecedents produces uniformity of consequents also. In medical and in sanitary matters, the same principle eminently applies. How many thousands of important decisions are made daily by the application of analogy, and how fruitful is this procedure in good results! But how few, comparatively, are guided by the results of actual and immediate experiment. The few labour and the many enter into their labours. Experimental philosophers and discoverers are rare; but innumerable are those who, by the knowledge of their discoveries, and the use of analogy, reap the fruits of their sublime achievements, and confer untold benefits on the world. This principle, though constantly operative, is no doubt obscurely recognized; and the reason of this is, that it is often prejudiced by misapplication. Were it possible by due discrimination to secure identity of circumstances in the matter dealt with, compared with that to which by analogy we liken it, there would be no disappointment in results. The event would answer expectation, and the principle would be as familiar and well known as its effects would be evident and beneficial. In inquiries in science this precision is attainable, and the progress in knowledge corresponds; but, in the vast multitude of the world's mixed affairs, discrimination is often at fault; perfect adaptation and similitude neither can be effected nor offers itself; the conclusions we desire and anticipate come not into view, or come denuded of their splendour or mutilated in their proportions; and then doubt and mistrust and suspicion attach to the principle and procedure, which ought rather to be attributed to him who has made a wrong application of them. In applied science, therefore, the obstructions are formidable, the world is incredulous, and progress is slow. Yet sure it is though slow.

And just in proportion as care and discrimination are used in the application of principles in practical science, established by experiment, or examples, to cases in actual life, just in the degree there is attained a conformity of conditions or circumstances between these original examples or experiments and the analogous cases which present themselves,—just in the same degree and proportion shall results conform to expectation, effects to principles, and then shall the application of them by analogy stand vindicated to all the world. Practical ability consists in the perception of these analogous conditions, and he only profits by experience, who learns readily to apprehend and rightly to use them. The sanitary measures resorted to at Kurrachee may be regarded as bearing a double relation. When it is considered, that examples innumerable have established the principle, just as if it had been ascertained by so many experiments, that impurities caused by waste and recrementitious vegetable and animal matter contaminate the air, which being respired in this state originates disease in the human frame, that the removal of these impurities where they exist, or the prevention of them, removes or prevents disease; and when by analogy use is made of this principle, and the cleanliness it demands is realized in Kurrachee, and the exemption from disease which was expected is experienced, the measures adopted here are in that case neither an original experiment, nor a deduction from numerous observations, but the application of a precept or principle by analogy. There is no novelty and no uncertainty in the matter: on the contrary, the precept or rule of cleanliness receives additional illustration and confirmation from the new example. Again, if we look at the measures put in use here, not in reference to the principle that guides them, or the end proposed, but considered as the means by which this is effected, these it is seen are peculiar, and perhaps merit some separate consideration. It might almost seem, indeed, that in this view, what has been done here may claim the rank of an original experiment. Original only, however, it is, in the means employed; and in urging the necessity of the strictest sanitary police for the health of troops in camp or cantonments, and in holding up Kurrachee as an example pregnant with instruction, it is to be observed, that what is

demonstrated and enforced by it, is cleanliness. If it be thought and said, that the means used here,—the burning in furnaces, and the burying in trenches, of the waste matter of the town and cantonment,—are simple, easily worked, and admirable in their effects, and therefore worthy of imitation elsewhere, this is quite a secondary affair. What is really insisted on, is an absolutely perfect system of sanitary police. The means by which it is carried out may vary indefinitely, but that method only is the best, which, without damage done to any private or public interest, combines cheapness in cost, ease in working, and efficiency in result. It is the object then of these remarks strongly to insist on the benefits of sanitary police at Kurrachee, to urge the adoption of similar measures in every standing camp or cantonment or town in India, and if no better means suggest themselves, to recommend the use of those which have been employed at Kurrachee.

It remains to present in brief form the conclusions established, and measures recommended. Drunkenness the parent of crime, disease, and death, is an obtrusive, obnoxious, habit in the Army. All endeavours yet made to eradicate the evil have failed. The next great step to be made in order to extirpate drunkenness, that without which other means will prove abortive, is the abolition of the Canteen. Prostitution, which produces five times a greater amount of venereal disease in European Regiments than what exists in Native Regiments, ought not in any way to be sanctioned; nor ought any regulations, except those which are repressive, to exist on the subject of prostitution. Marriage, on the other hand, the only effective remedy for immorality and for venereal disease amongst the troops, ought not to be restricted but free, and the additional cost which might follow, if any follow, should be asked for from the nation, which must have troops, and would chose rather to have moral, healthy, effective troops, and would willingly pay for them. As respects accommodation, that hitherto supplied to troops has been extremely defective, nor has the nature of the structures in Barracks and Hospitals remedied the defect. Two alternatives exist, if a remedy be sought. These are, enlarged structures or ventilation. Space in buildings and ventilation bear an inverse ratio

to each other, and as, in India, artificial ventilation does not exist, ample space is all the more requisite. This space must always be required in hospitals; but if the expense for barracks be too great, another course, not before indicated, may be adopted in lieu of barracks. Following the example of Native troops, let the men marry and live in cottages. These aggregated, and constituting villages, would resemble the lines of a Native Regiment. Perfect cleanliness, in every town, station, camp, cantonment, in India, should be observed. Waste matter of every kind should be with the greatest care, if not applied to agriculture, or other useful purpose, disposed of as at Kurrachee, by incremation or inhumation. If we suppose the troops to have good water, good food, good clothing, and good medical attendance, the measures enumerated above seem to be those which make the complement of what is needed to constitute a perfect sanitary system for the Army. They are not less important, though less obvious and appreciable to sense, than those advantages which we assume the troops to enjoy. Their importance is such, that no greater benefits, when we except Divine grace which no act of man can convey, can be conferred on the troops. The want of them vitiates much good. The attainment of them, therefore, is a double benefit. In the removal of evil, in imparting good, in the emancipation from pernicious influences and restrictions, and in bestowing those privileges and advantages on the troops, the ravages of immorality, disease, and death will be checked, many valuable qualities will be brought into being, the soldier will rise in new splendour and dignity, become an example to the nations, and adorn the religious character of his country, to which he has too long and too often been a blot and a reproach.

It remains to make one remark. It has been said by a high authority,* European Soldiers in India cannot maintain health or vigour in the plains. Without disputing the statement, the fact, it is averred, has not been proved. The statement, it may be said, rests on experience. But the experiment has never been made, nor experience gained in circumstances which command respect. If the foregoing remarks prove anything, they show

* Papers relative to Sanitary Establishment p. 71, para 11, April 1860.

that the conditions of the experiment have never yet been pure and simple; that accessory conditions have produced disturbing effects, and vitiated the results. What is called experience, therefore, in this case, is fallacious. We may not affirm that the assertion is wrong; we affirm that the conclusion is premature. This point is to be decided only, when the conditions of the experiment have been purged. Then only shall we attain a conclusion, as derived from the unmixed conditions of the case, on which reliance may be placed. This remark applies to the plains generally, as also specially to many stations, pronounced unhealthy, when the experience which decided the question was both far too limited, and obtained under circumstances, which, as they vitiated it, should have robbed it of the confidence hastily reposed in it. Again it is repeated, purge the conditions of the experiment of all accessories that complicate and vitiate it; then begin anew; note what happens, and adopt it as conclusive; for then only are we following the rules of philosophy; then only reaping facts, which as the fruit of genuine experience, are entitled to confidence and respect.

ANNUAL REPORT* OF THE SANITARIUM POORUNDHUR, ENDING 31ST DECEMBER 1860.

BY ASSISTANT SURGEON W. A. SHEPHERD,

In Medical Charge.

Presented by the Principal Inspector General, Medical Department.

This report consists of:—

1*st.*—An historical sketch of Poorundhur.

2*nd.*—A description of the present Hill Sanitarium as respects barrack accommodation, &c.

3*rd.*—Of the climate and productions of Poorundhur.

4*th.*—The medical history of the year 1860.

[A fifth part, referring to changes made during the year, with observations thereon, being of ephemeral interest, is omitted.]

Historical Sketch of Poorundhur.

In latitude 18° 20′ N. and longitude 73° 54′ E., 4,472 feet above the sea level, and 2,566 feet above the plains of Poona, from which it is distant 19 miles, rises the hill fort of Poorundhur.

Poorundhur, one of the names of the Hindoo God "Indra," or, as it was called in the early times of the Delhi Empire, "Awultaza," "chief of mischief," is the loftiest height of a partially detached spur, from the eastern side of the western Ghauts. This spur extends about 30 miles, in a south-easterly direction, and is the water-shed of two streams,—the Neera on the south, and the Kurra on the north. The basaltic hill of Poorundhur stands nearly east and west; its strata form an anticline, hence it is said to be of a saddle-back shape; it gradually slopes down on its north and south sides to the valleys below, above which

* The whole of this Report has not been published.

it rises upwards of 1,000 feet, and enriches annually with its disintegrated particles, which the wind and sun from its rough sides crumble free, and the rain washes away. Looking down on these valleys or basins of black soil, everywhere showing signs of vegetation and fertility, the eye wanders to the ridges of basaltic mountains that form their rim; basaltic picturesque terraced mountains with their undulating outlines, step-like ascents, abrupt crags, now showing a tabular summit, and now a papular pinnacle, and all looking as if they had been deposited there, in ages of boiling commotion long since fled. Could the past give utterance, it would I believe tell us, that the girdling stone wall, which fortifies the summit of Poorundhur, with its many semicircular bastions, was built by Sultan Mahmood Shah Bahminee, in the Arab year 587, and A. D. 1384. Sultan Mahmood was, according to Ferishta, the fifth Sultan of the Bahminee Dynasty, and the younger son of its founder, Kuffer Khan, who assumed the title of Sultan Alla-ud-deen Hossein Kanjah Bahminee.

A. D. 1384.

The first historic allusion I find made of Poorundhur, in the volumes of the graphic Duff, occurs at page 56 of the first volume of his Mahratta History, where we are told, that the "said Kuffer Khan, he who from humble origin rose to be the founder of a race of kings," obtained possession of almost the whole of the Maharastra, except the Concan Ghaut Mahta, from the Poorundhur range of hills, to the Hurkarree River." Thus in 1350, thirty years before the supposed date of the completion of its fortifications, Poorundhur appears to have been of sufficient importance to give its name to a range of hills. Again at p. 117 of the same history (Grant Duff's) in a foot note, we are informed that "Poorundhur with Kondaneh, were two of the forts which, under the Mahomedan Government, were reserved by the king, and not entrusted to the care of Jagheerdars." Thus we find in 1386, or ten years after the birth of Sivajee, that Poorundhur, with Kondaneh—the ancient name of Singhur—were under charge of Killidars, and that he who had been appointed to the charge of Poorundhur by Morar Punt, an able Brahmin and powerful

A. D. 1350.

A. D. 1386.

minister of Mahomed Adil Shah, was Nilkunt Rao, an old adherent, and on terms of intimacy with Sivajee's family. This worthy died in 1647, leaving three sons to claim the succession to the Killidarship of Poorundhur. Glancing back a year, we find that Sivajee, then 19 years old, had persuaded the Torna Killidar to yield that fort to him. There, while digging under the instructions of an old Joshee, he discovered immense wealth, which was attributed to Bhowanee the tutelar goddess of Sivajee's family. With these sinews of war, arms and ammunition were purchased, and Sivajee determined to build another fort on the mountain of Morbudh, one of the most precipitous in this mountain district, on which he had often cast his eyes, it being only three miles south-east of Torna. To this fort, which he fortified with astonishing exertion, he gave the name of Rajghur, which obtained for him from the bigoted Aurungzebe, the epithet of "Mountain Rat." A still more important acquisition, that of Kondaneh, was yielded to him by its Killidar, in consideration of a large bribe, and Sivajee then, either changed or restored its name to Singhur, or "The Lion's Den." On the death of Nilkunt Rao, and the dispute of his sons, Sivajee, being now of position and importance, was called upon to arbitrate. Giving out that he was *en route* to Soopa, Sivajee quietly set off and encamped at the foot of Poorundhur, in the village of Naryenpoor, "and was, as he hoped to be, invited into the fort with a few attendants by the disputant brothers. When the eldest of the three had retired to rest, Sivajee, in conversation with the other two, represented that the best expedient for inducing their brother to submit to a fair arbitration, was to make him prisoner; to which the young men eagerly acceded. Sivajee, on pretence of granting them means of completely overawing every attempt at resistance, despatched a messenger to his troops below, and long before morning, had a band of Mawalees in possession of the upper and lower forts, the eldest brother a prisoner, and the two younger, with the whole garrison, completely in his power." Sivajee had the address to reconcile the brothers by grants of Enam villages; and persuaded them to enter his service, in which they ultimately attained distinction (vide Grant Duff, vol. 1, page 136).

A. D. 1647.

Thus does Poorundhur, by a dangerous, adroit, and successful act of faithlessness and firmness combined, become his who, by persuasion, had acquired Torna, and by wealth found at Torna, built Rajghur, and purchased Singhur.

Passing over much that is interesting, important, and stirring in Mahratta history, connected with Sivajee, and looking down from the Delhi gate and Banner bastion of Poorundhur, in 1665, we see the forces of Aurungzebe surrounding that fort, under the command of Jey-Sing, and Dilere Khan; the former, a Rajpoot prince, grandfather of the celebrated astronomer of that name, and the latter an Afghan, both, the best of Aurungzebe's officers. Poorundhur was strongly garrisoned by Mawalees and Hetkerrees, under Havildar Bajee Purvoe, a Deshpandya of Mahr, who disputed every point of the approaches; but his out-posts being driven in,—we now continue the narrative in the words of Grant Duff—Dilere Khan commenced "mining a rock under one of the towers of the lower fort. The garrison made frequent sallies, and repeatedly drove off the miners, but they were at last firmly lodged under cover; after repeated failures, they succeeded in shattering the rock and defences, so as to enable them to attempt an assault. They had gained the lower fort, but whilst the garrison was retiring to the upper, the assailants, careless or insensible to the danger to which they exposed themselves, dispersed to plunder the houses, when the Hetkerree marksmen from above, opened a fire so destructive that many of the assailants sought shelter in every corner, and others ran outside to get under cover of the rock. At this moment the Mawalees, headed by their Commander, sallied out, attacked the Moguls sword in hand, killed all that opposed them, and drove them down the hill in view of Dilere Khan, who was seated on his elephant, near the bottom, observing the progress of the assault. Seeing the flight of his men, he bent his bow, called to a body of Patans to advance, and, rallying the fugitives, pushed forward his elephant; but the garrison, like the Mahrattas, daring in success, closed with his men, and even the hardy Afghans began to recoil from the swords of the Mawalees, when Dilere Khan, having marked the conspicuous conduct of their leader, with his own hand

A. D. 1665.

pierced him with an arrow, and killed him on the spot. The whole of the garrison accompanying him instantly fled, nor stopped until they reached the upper fort. The Moguls again took possession of the lower fort, but the fire from above obliged them to relinquish it. After this failure, Dilere Khan, considering the Northern face impregnable, determined on attempting to escalade Wuzeerghur, a small detached fort, situated at the N. E. angle of Poorundhur, which commands a great part of its works. The attempt succeeded, and guns were brought up to breach the upper fort, but the rains had set in and greatly retarded operations. The Mogul Artillery was extremely bad, and although they continued for weeks, little impression was made on the defences. The garrison, however, became dispirited, and sent notice that they could hold out no longer. They would have evacuated the fort, but Sivajee particularly desired them to maintain the defence, till he should send them an intimation to retire." Unaccountable as it may seem, he who murdered Afzool Khan, and defeated and dispersed his immense army; who had escaped from the surrounding forces of the brave Seedee Johar, and turned his back on the hill fort of Panella; who had stabbed Shah Shassteh Khan, and slain his son, emcamped though they were in the midst of their forces at Poonah, and had plundered the rich city of Surat, unaccountable as it may seem, this man of caution and strategem was induced to trust Jey Sing's guarantee, and in July 1665, with his own hands, presented the keys of Poorundhur to Dilere Khan, and with them, surrendered nineteen other forts. Of all the forts surrendered by Sivajee or captured by his aid, Jey Sing was only able to place strong garrisons in Logar, Singhur and Poorundhur. Five years later, A. D. 1670, we find Sivajee escaping from Delhi, assisted to do so by Ram Sing, the son of Jey Sing, under whose charge he had been placed, and who, indignant that his father's engagements should have been violated, as they were by Aurungzebe, aided his prisoner in his flight. Despite the favors which Aurungzebe now heaped upon him, such as the title of Rajah, a jagheer in Berar, the restoration to him of the districts of Poonah, Chakun, and Sopa; the command-

A. D. 1665.

A. D. 1670.

ing forts of Singhur and Poorundhur being alone withheld, we find him stirred with the desire to regain possession of these important fortresses. And when the temporising measures of Aurungzebe began to assume a hostile character, in 1670, we find him besieging with the utmost resource and bravery, and seizing the fortress of Singhur. At the capture of this—which being commanded by Ooday Bawn, a celebrated soldier, with a choice garrison—was considered impregnable, Sivajee had the misfortune to lose his best officer and friend, Tannajee Maloosray, the faithful friend who received him on his escape from Delhi, at Mutra; and when congratulated on the success of his arms, he exclaimed "The Den is taken, but the Lion is slain. We have gained a Fort, but, alas! I have lost Tannajee Maloosray." One month after this, Sivajee, having enlisted in his service the Rhamoosee inhabitants of the surrounding villages, retook, by escalade, the other desired fortress of Poorundhur. Ten years later, and he, who had roused into action the long dormant spirit of the Mahrattas, and headed them in many a hard-fought battle, and plundering fray; whose wise policy admirably adapted to the times, whose genius, courage, firmness, moderation in success, judicious expenditure of wealth, and high ambition, had made them a nation, and broken for ever the Mogul yoke in the Maharastra; he who, despite the grave faults of his ambitious character, of his age, his faith and nation, must be called, The Great Sivajee, died, on the 5th April 1680, in the 53rd of his age; and with him, all that is stirring in war or peace, all that is romantic in daring or strategy, in a word, all that invests Poorundhur with Sivagean interest, ceases. After this, we find little or no mention of Poorundhur until in 1714, Ballajee Wishnauth, the ancestor of the Rulers of Poonah, was appointed Peishwa. To him was given, in a fit of gratitude, by Jessoo Bae, the mother of the Punt Sechew, of Bore, for saving her son, the Purgunnah of Poonah and Fort of Poorundhur. On the same pretence Ballajee obtained a grant of it from Shao Rajah also. And Poorundhur, thus, from time

A. D. 1670.

February 1670.

A. D. 1680.

A. D. 1714.

to time, as the Peishwa's power superseded that of the Sattara Rajahs, became a sort of strong-hold, to which the Poona Peishwas, the Mayors of the Sattara palace, retreated, when safety had left their own capital.

Grant Duff remarks, in vol. 2, page 203, that Mahdoo Rao, after his capital was destroyed by Nizam Ally, proposed to surround Poonah with a strong wall, but abandoned the idea, "lest it should ultimately occasion irreparable loss by holding out a security to property, which was best ensured by a dependence on the strong hill-forts of Singhur and Poorundhur." On the morning of 30th January 1774, Gunga Bae, widow of the murdered Narrain Rao, being pregnant, was carried off by Nana Furnawees, and Hurree Punt Parkey, and conveyed to the fort of Poorundhur as a place of safety, where her son Mahdoo Rao Narrain was born. Ten years later, 1st May 1776, Colonel Upton, who was sent direct from Bengal by Warren Hastings, concluded here a treaty with Nana Furnawees, known by the name of "The Poorundhur Treaty." In 1771, when Nana Furnawees was on the eve of an outbreak with the English, he sent the young Peishwa, Mahdoo Rao Narrain, now in his 7th year, for safety to Poorundhur. Approaching nearer to our own time, we find Poorundhur invested by a British force under General Pritzler, who took it after a few days' bombardment, on the 10th April 1818. In 1823, Captain Wogan Brown, having been appointed Superintendent of Hill Forts, entered it as Commandant. And 29 years later, in 1852, it was converted into a Sanitarium, under Lieutenant Butler and Dr. Todd. Since which time, Poorundhur has been under the command of six Commandants, and the supervision of nine Medical Officers. From 1852, to the present date, the end of 1860 (nine years), 1,929 patients have been treated on the Hill for cure. 1,474 of them have been returned to duty; 29 have died, 329 have been sent down unsuited to the climate, and 97 now remain on the Hill.

A. D. 1774.

A. D. 1776.

A. D. 1771.

A. D. 1818.

Description.

This Hill-Sanitarium is distant from Poona 19 miles by the Bap Deo Ghaut and Chumley, and 25 miles by the Dewa Ghaut and Sassoor, which latter road alone is practicable for carriages.

From the bungalow at Sassoor, the Hill is distant six miles, by a cross country road that has few of the qualifications of a macadamised one, and is broken in many places by nullas. From the Barra of the last Peishwur at Sassoor, Poorundhur appears to be less lofty than Wuzeerghur, which, standing as it does, slightly in advance of it, partly hides Poorundhur. From the Bap Deo approach, the two forts are seen divided by a Khind, Wuzeerghur showing a hog-backed shape, and Poorundhur a saddle-back, standing separate from each other, connected only by the narrow khind, and from this direction they present their true appearance. Poorundhur appearing, as it really is, larger, higher, and more important than Wuzeerghur. From the top of the Bap Deo Ghaut, it is distant about 12 miles; the road by the village of Chumley, is a wide, metalled one, and thence, by one recently made—by prisoners—Poorundhur is easily reached.

Both hills as they are neared, appear crowned on the top of their natural basaltic fortifications with a rim of masonry, studded here and there with bastions. Poorundhur, the larger and higher, is varied by two risings, on the higher of which—the loftiest point in the range—is a Hindoo temple dedicated to Mahadeo. The hill on which this temple stands, is part of the upper fort of Poorundhur, while on its northern face, 300 feet below it, and upwards of 1000 feet above the plains, runs a horizontal terrace, upon which stands the cantonment, flanked on the east by the barracks, and on the west by the hospital. This terrace is defended by a low wall skirting its northern edge, several semicircular bastions, and a gate flanked by two towers; it is called the Mauchee or Lower Fort. At the foot of the hill, as approached from Poona, is a well-built rest-house, and a putteewalla always in attendance, to supply water, and to give intelligence to those stationed at the gate already mentioned, of any arrival. From this rest-house the ascent is easy, by a good, wide road; whose gradient is 1 in 8. Half way up, the road divides

to the right and left, where a board is placed, indicating that the right branch leads to the hospital, and the left, to the Stone Gate, in the centre of the cantonment, and ultimately to the barracks.

Poorundhur is inhabited, Wuzeerghur is not; and as Wuzeerghur is the least important, I propose to give a short description of that first, then of the upper fort of Poorundhur, and descending thence, to take the lower fort, comprising the cantonment barracks, and hospital. Wuzeerghur is said by some to have been built by the Mahrattas in the fifteenth century; another, and more probable account I have gathered from some of the descendants of an old family, who have resided on this hill since before the days of Sivajee, or time out of mind. They state that it was built about six months after the completion of Poorundhur by the Wuzeer, or Prime Minister, of Sultan Mahomed Shah Bahminee, A. D. 1384-5, hence they account for its name, Wuzeerghur, the home of the Wuzeer. It bears also a more high-sounding name—Wuzeerghur, the home of the Thunder Bolt. By the Mahrattas it is also called Rooder Mahal, palace of the god Rooder, to whom there still exists a temple.

Wuzeerghur presents the appearance of rising in the middle, and sloping at each end, somewhat after the fashion of a hog's back, whence it has been called a hog-backed mountain. It rises almost abruptly from the plains, has somewhat of a tabular summit, in the centre of which a basaltic column crops through to about the height of 50 feet, and the whole ridge, like Poorundhur, is fringed with a wall of solid masonry, with many semicircular bastions, constituting the Fort. It is entered on its north-west side by a strong gate, approached by a winding narrow path, terminating in many steps, and flanked by bastion towers. The outer gate is supposed to have been added by Nilso Punt Moreshwur, the second Peishwur. The hereditary warder of this fort, a pensioner of Government, by caste a Dhár, who rejoices in the name of Dyottee bin Vithnaik, lives at Narreynpoor, a village at the foot of Poorundhur. In its encient are the ruins of the barras, dwelling-houses, and public offices; there are also two temples, and four or five tanks, two of which are of fine masonry. Through a crumbling arch, that reminds one of the early English archways, we pass from the western

or upper portion of the fort to the eastern or lower portion, in which are the two tanks just mentioned, on the right of which stands the temple to the god Rooder. Wuzeerghur stands above the sea-level upwards of 4,000 feet. It is a continuation of the Poorundhur parallel, and forms from the plains beneath an angle ranging from 20° to 40° with the horizon. On its northern side a long spur, like three gigantic steps, extends into the plain. This spur is called Sassoor point, and by the Natives named Kupildao. On its eastern side are the ruins of the house of the noted Omajee Naik, the celebrated Ramoosee Chief, who, from 1836 to 1838, kept our troops playing at hide-and-seek after him. On the middle step, or table-land of this spur, stands a flag-staff, where a putteewalla is placed, who hoists a red ball as a signal to the station, that the postman from Sassoor is at the bottom of the hill. From the north-east face of Wuzeerghur, runs a spur connecting a number of hills, which, ending at Jejooree, terminates the Poorundhur range; and from its south-east end a narrow spur extends, in shape an anticline, to a hill which is capped by a solid, upright, pillared mass of basalt, and is called, from its resemblance to a *Ghee Dubbar*, the Baudla or Bottle-Hill. Between this spur and the eastern face of Poorundhur, an extensive valley is formed. Round Wuzeerghur, a good, broad walk or road runs, called from its length the three-mile walk, several seats being placed at intervals, where the most extensive views, and greatest depth of shade are commanded. The views from the summit of this hill are as extensive as they are varied and picturesque, but, as they will have to be seen from the top of Poorundhur, we leave their description till we ascend that fort.

From the middle of the cantonment of Poorundhur, runs a winding road, 830 yards long, towards the upper fort. This road terminates in a flight of rude stone steps, which pass in a zig-zag direction, between a loop-holed wall of masonry and the precipitous basalt on which the fort stands. A sharp turning brings us suddenly to the Delhi Gate flanked by its solid bastion towers. Passing under this gate, and turning to the left, we continue our way along a narrow ridge, flanked on each side by a loop-holed wall; the path in some places is only eight feet

wide, with a precipitous fall on either side of upwards of 300 feet. We arrive at the Kaud-Kurra, or sky-scraper bastion, the most eastern point of Poorundhur, commanding a view of Wuzeerghur and the Bottle-Hill, and over the rich valley of the Beema, to the distant Mahdeo Range. Here Colonel Lester, some years since, built a bungalow; near this bungalow is a small tank, and postern gateway, called *Chor-dindee Derwaza,* the back-stair gateway. Retracing our steps to the Delhi gate, we pass through the Gunesh Derwaza, looking, as we do so, at a small chamber in the thickness of the right-hand flanking tower, and wonder with horror, as the thought strikes us, that in such a chamber was Shajee, the father of Sivajee, confined in 1649, by Mahomed Adil Shah; while on our left is a dilapidated figure of the god Gunesh, from which the gate derives its name: through a third gate, remarkable for nothing save that the bastion on its right is called the Dhajee Burj, or Banner Bastion, a bastion from which many a time and oft has floated the swallow-tailed ensign of Sivajee, waving defiance. We now observe on our left, a bomb-proof building, once a granary, now converted into a summer residence for the Revd. Mr. Gell. Near this granary, rises a solid-looking mass of masonry, the site of a palace said to have been built by Abbajee Poorundhuree, the ancestor of the once great family of the Poorundhurees, about the year 1710; he was one of the Revenue Carcoons of Dhernajee Jadow. A little in advance of this, is a bungalow called the Eagle's Nest, and for the sake of arrangement, we will follow the path that passes in front of it, observing, *en passant,* the Adawlut Tank, above which are the ruins of the Court of that name. A little in arrear, stands a Musjid, built probably about the time when the fort passed from the hands of the rude Mahratta rulers, into those of the Moguls. Continuing our path toward the west, we pass, on our right, two small covered tanks looking like tombs, used during seiges to contain oil and ghee for the garrison. We may also observe on our right, high above us, a bomb-proof magazine, under shelter of one of the two great risings which mark Poorundhur.—(See page 53.) This eminence, by some, is called Sungorey Chokey, or Love's Seat, and by others the Raja's Warra, from the fact that Shao Rajah began to build a

palace here. Shao was the grandson of Sivajee. His father Sumbhajee having fallen into the hands of Aurungzebe, was barbarously executed about the beginning of August 1689, in the camp bazaar of Tolapore. His widow Yesso Bae in 1690, on the Fort of Rajghur being taken by Yeatikad Khan, was made prisoner with her son, Sivajee, and conveyed to the Emperor; the boy and mother, found a friend in Begum Sahib, Aurungzebe's daughter, and the Emperor himself took a fancy to the young Sivajee, whom he used to call "Sahoo," which appellation, pronouncing it "Shao," he ever afterwards retained.* A little in advance of us, and still on the left hand, is a tank of beautiful water called the Musoba Talao, or Ghost Tank, running a short distance under the rock, and always fed with springs, affording drinking-water to the greater part of the inhabitants throughout the hot season. A little in advance of this tank, are two dungeon-looking chambers, also cut underneath the solid rock; and dungeons they truly were, for here in this malarious den, were prisoners confined, and deprived of their salt until they died, covered with fearful blotches. Above this, runs a rough path to the spur that connects the eminence just mentioned, with that which is temple-crowned.—(See page 52.) This spur terminates at the foot of a flight of steps, arranged in sets of five of very fine masonry, as is the stone wall that rises on either side of them; they lead to an equally beautifully built platform, which covers the eminence, and from which rises a temple to Mahdeo, one of the principal Hindoo Deities, particularly worshipped in the Mahratta country: it was built by the first Poorundhuree.

Retracing our steps to where we commenced the ascent, we continue our way past many ruins of houses of the Mhars, until we reach the Khudda Derwaza, built by one of the Peishwurs for the accommodation of the priest of the temple. Slightly in advance, terminating a spur, is the dilapidated Futish Burj, or Victory Bastion, by the Hindoos called Dzoondermal, the Battle-stroke Bastion. It was from this bastion that the garrison at the end of the last century, under one of the Poorundhurees, when surprised by the Koolies under Koorojee Naik, are said to have leapt. The Koolies held the Fort for some time, and from them

* *Vide* Grant Duff, Vol. 1. p. 367.

it was retaken by Umrut Rao. Following the narrow path that runs along the back of a spur, we reach a bastion on the extreme south-western angle of the fort, called both by Hindoos and Mahomedans the Konkanee Bastion: while resting here, and examining the bomb-proof chamber, capable of holding twenty men beneath its floor, we have time to think over the acts of cruelty that have been perpetrated on this bastion, which rises 300 feet of perpendicular height, from the spur beneath. We allude to that mode of punishment, called Kurra Lote, or precipice rolling, a name suggestive of one of those cruel modes of execution, that stigmatise not only Mahratta rulers, but Mogul Emperors, and Christian kings. From this precipitous bastion, used criminals, folded in their cumlies—their head and feet alone left out—to be thrown. The last, who perpetrated this barbarism here, was the iniquitous Bajee Rao. Continuing our walk towards the north-west we arrive at a triple bastion, which, from the very rude resemblance it bears to an elephant's head, has received the name of the Hathi Burj: past this, and one or two tanks of clear, deep water running from underneath the rock, we arrive at last at the Shendree Burj, a bastion to which tradition lends a painful interest, as having been built over much wealth, and being also the living tomb of two children. What truth there may be in the story of the burial, either of the wealth or the children, may be gathered from the documents appended.*

* No. 1 is a translation of the original, which was discovered by Captain Dods in his office: No. 2 is a copy of what was said to be inscribed on the copper plates belonging to the Koolies of Poorundhur. The originals are in the Madras Museum, whence this copy has been derived: its mode of translation is quaint.

The Poorundhur Sunnud.

"An Inampute (title deed), dated in Juba Sunianeen Khumas Maya (A. D. 1186 and 1187), from the Badshah of the Bedur States, to Esajee Naik wulud Kritsnajee Naik Chivey, Hybut Naik wulud Venkut Naik, Khononay Dutajee Naik wulud Ramjee Naik Bandulwutkur, and Baheer Naik wulud Soan Naik Beglay, to the following effect:—

That while constructing the Tower of the Fort of Poorundhur, called the "Shendree Boorooj," it was found, that the work could not be completed, and the Emperor, at the same time dreamt, that unless a man (the eldest of his parents) and wife were sacrificed on the spot, it could not be built up; on awaking, the Emperor sent for Esajee Naik Chivey, and told him about the dream. Thereupon Esajee undertook to procure a pair for the sacrifice, and assured the Emperor of his being able to do so.

From this bastion we proceed until we reach a fine tank immediately on our right hand, called, I suppose from the flavor of its water, Sukaree Talao, the Sugary Tank; a little in

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Esajee then called Buheer Naik, and communicated to him all that passed between himself and the Emperor regarding the dream. Buheer Naik, thereupon, offered his eldest son Nath Naik and his daughter-in-law (Nath's wife).

Esajee next represented to the Emperor, that a pair such as was wanted was found, for sacrifice: accordingly on the 8th of Ashween Wudjee, Nath Naik and Deokaee were buried alive underneath the Tower. At the same time 25,000 bricks of gold, each weighing 23¼ tolas, were put into a hole 7 guz deep, and 13 guz square, in the right side of the foundation of the Tower; and the same number of gold bricks, of the same weight, were put into a hole of like dimensions in the left side of the Tower. The work then proceeded, and on its completion, the Emperor made a visit to the Fort (Poorundhur) and was highly pleased to see the "Shendree Boorooj;" and, as a reward, conferred the Fort on Esajee Naik. He also made a grant to Buheer Naik, of the Villages of Nhavee and Bhoglee, the former valued at 205 Hoons, and the latter 705 Hoons. The Emperor then returned to Bedur, accompanied by Esajee Naik, afterward Abdool Shah."

(The document is incomplete.)

Note.—The Naiks mentioned were probably Ramoosies, as the connections of the Ramoosies with the Bedur Kings is well known; on the other hand the Náks were probably Parwaries.

The amount of gold here mentioned is about one million and three quarters sterling.

Translation of a copy of what was said to be inscribed on the copper plates belonging to the Kolies of the Fort of Poorundhur.

"Freehold grants to Essoo Naik son of Kristnajee Naik Chooha, and Hybut Naik the son of Venket Naik, and Duttoojee Naik the son of Ramjee Naik, and Bhyrjee Naik the son of Lone Naik, from the King of Bedur, in the Arab year 587; on a copper plate it is written, that in the Fort of Poorundhur at the Sendry Bastion, they had been going on with the building, but that it was unfinished at this time; the king said in a vision, that if the eldest son and his wife were given (viz. to be buried in the foundation) the work would prosper, such was the King's dream. The Prince awoke, and getting up sent for Essoojee Naik Chooha, and explained to him the nature of his dream; upon which Essoojee Naik said that he would (try to) effect the desired object, and, although difficult, that he would accomplish it. Having stated this much, he sent for Bhyre Naik, and related all the particulars (of the dream); hearing which, Bhyre Naik answered, I will give my eldest son Nath Naik and my daughter-in-law (for this purpose). When he said this, Essoojee Naik represented to the king that he (Bhyre Naik) was willing to give his son and daughter-in-law. All was arranged on the 8th of the dark half of Asswin: on the right hand side of the Sendry Bastion, Nath Naik and Deowakaie (his wife) were both buried (alive) after which the works of the bastion were finished; and the king came from Bedur to Poorundhur to see the fort; and having inspected the Sendry Bastion, His Majesty expressed much satis-

advance of which, a stone wall indicates the site where once stood the house of the Kolee Naik Kondajee; a few yards from this we reach a substantial stone house once used as a granary, and said

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faction. He granted the fort of Poorundhur entirely to Essoojee Naik and Bhyrjee Naik. The king gave from the fort of Poorundhur (205) two hundred and five Hoons (money of the time—a Hoon worth about four Rupees); and from the two villages of Nhavie and Bhouggoly (705) seven hundred and five Hoons; after which, the king returning to Bedur, Essoojee Naik accompanied His Majesty. After this, Essoojee Naik and Venkut Naik were both detached against Abdul Shah; having punished the enemy and obtained victory, they returned to Bedur.

The monarch being extremely pleased, he granted to them at Poorundhur, money, the Sir Naiky, and Enam land (freehold) in different villages as follows:—

The Sir Naiky of Rajghur for	Rs. 5,000
The Sir Naiky of Torna Fort for.....	,, 4,800
Total Rupees....	9,800

Land in the following 17 *Villages.*

In Sewry.....	7½	Chours.	In Belsur.....	2	Chours.
,, Kherebary 10		Do.	,, Sassoor	5	Do.
,, Peemply	1	Do.	,, Koldury	2	Do.
,, Chambly	4¼	Do.	,, Pandy	4¼	Do.
,, Keekvy	1	Do.	,, Singhur Hill ..	2	Do.
,, Mhour	1½	Do.	,, Mandur	1½	Do.
,, Pareenchy ..	3½	Do.	,, Wagoly	3	Do.
,, Narrain	1¼	Do.	,, Khullud.....	1½	Do.
,, Soopah	2	Do.	Total....	53¼	Chours.

(equal to 6,030 Begahs) and the (9,800) nine thousand eight hundred Rupees were granted in freehold, and a deed bestowed about a year afterwards. The king went on a hunting excursion. On this occasion Essoojee Naik Chooha killed a Royal Tiger, which he placed before the King; His Majesty being greatly pleased, directed the Naik to ask what present he wanted. Having respectfully saluted the King, after a short silence, he represented, that the fort of Poorundhur and the Sir Naiky, and freehold lands of different villages, and Nhavy and Bhouggoly, both these villages, and money, were formerly bestowed, "and all I ask for now, is that the grant above alluded to should be written out on a copper plate; that the tribe of Kolies may alone continue entitled to it, and no other may interfere with it," according to this representation a copper plate should be prepared. The King being well pleased, called both Dummul Punt and Beerbul, and gave them to understand that he had previously given up the fort of Poorundhur and all its stores, &c., to Essoojee Naik Chooha; they were therefore to deliver all over to him, and Beerbul got all the old Deeds from Essoojee Naik, and from these prepared that written on the copper plate; therefore you and your offspring are to enjoy this grant from generation to generation, and he who shall deprive you of the same must be born of a Hog."

to have been built by Mahdeo Rao; and still a few more yards in advance, and we are at the point from which we commenced our round of the fort. We have walked over more than two miles of ground; have seen its three gateways, the six principal of its many bastions, and now returning to the highest point, the Temple Platform, we look down on scenery as varied as it is grand and extensive; on nests of mountains; on huge, black, barren rocks, and dense jungles; deep ravines, wide-spreading plains, and winding rives. To the north, the eye wanders over plain and mountain range, till it is lost in a distant ridge of pale-blue ghauts some eighty miles distant. On the first range is seen the road leading to the Bap-Deo Ghaut, and the Temple Hill of Narreyanpoor, and where the range dips, to the right of this Temple Hill, the pass of the Dewa Ghaut emerges, to whose right is the square dismantled fort of Matharghur, built by the Punacy family, who were the hereditary Commandants of Artillery under the Peishwas.

Of more historic interest, and still more to the right, is discernible the lesser Bore Ghaut, through which, on the 24th November 1817, passed our army under General Smith, *en route* to Punderpoor, in hot pursuit of Bajee Rao, whose immense army had been routed by a handful of Europeans, and a few sepoys, about a fortnight before at Kirkee. Another link in Mahratta history is supplied by the Palace of the Jadow family, which stands half hidden by a spur from the Dewa Ghaut, a little to the left of where it emerges; this palace is seen distinctly from the road from which it lies about two miles. It is a large, square, loop-holed building, with small windows and narrow doors, surrounded by a semi-detached loop-holed wall. Between the Dewa Ghaut and Poorundhur, are the villages of Narreyanpoor, Chumley, and Korait, and on the banks of the Kurra, where it forms a junction with a small stream, embosomed amid bamboo, mango, and palm groves, lies the city of Sassoor, with its two fine temples dedicated to Shiva and Mahadeva, and its large, square, substantial Barra of the Poorundharee, the building of which, and the two temples, are said to have cost nearly six lacs, or close upon £60,000. Near to this is also a summer residence of Bajee Rao, once used as a prison for the Ameers of Sind, now converted into a Travel-

ler's Bungalow and Collector's Cutcherree. Looking nearly east, terminating the range which derives its name from Poorundhur, is seen the Temple Hill of Jejooree, on which is erected a splendid temple to Khundoba, the patron god of the Rhamoosies, and where are yearly prostituted numbers of young women, under a plea of making them "brides of the God." This temple is approached by a splendid, gradual, and a very wide flight of steps. It was richly endowed by the first Holkar; he also built the beautiful tank here, which is enclosed with fine masonry, and is about 200 yards square; he was born at a village called Hohl, on the Neera. Not far from Jejooree, contiguous to the Poorundhur Range, and at no great distance from the Neera Bridge, may be seen the village of Kerwalla, celebrated as the birth-place of Walmeek, the author of the Ramayan, one of the popular religious poems of the Mahrattas; and the valley of the Beema, fringed by its distant hills, as is also that of the Neera.

Turning our faces to the south and looking over Sherwell, and beyond the Mahdeo Range, we see in the distance, Wyratghur, Pandoorghur, and Panchgunnee; and over the square hill-fort of Rohira, and the Bhore Durra, near which is the town of that name, we see Mount Malcolm, the Mahableshwur Temple, and Raireshwur, and in the valley almost beneath our feet, the many windings of the Neera, sparkling in the sun-light. Turning to the west, where range after range of mountains stretch away as far as the eye can reach, we travel over town and village, valley, hill, and khind, till we are arrested by the most inaccessible of Sivajee's fortresses, Rajghur, and the still older and more extensive one of Torna. Then over the Peak of Geser and Paluk Khind we are brought face to face with another of his fortresses, for here is seen, rising like a monarch of the surrounding hills, and standing bold against the western sky, Singhur or the Lion's Den; and so past the Donjee, Katruz, and Bap-Deo Ghauts, we reach again the Temple hill of Narreyanpoor.

Descending now to the Lower Fort or Manche, through the triple gate, by which we entered—the Delhi Gate,—we stay to examine a three-pillared or Cave-chamber, cut in the solid rock, almost beneath the Banner Bastion. There is nothing remark-

able in it, less so than in the majority of such chambers, and hastening from this close den, made more unwholesome by the presence of myriads of long-legged black spiders, retrace our steps down the steep winding path, by whose ascent of 830 yards we reached the Fort, and arrive again at the middle of the cantonment. Following the road that leads us past the canteen over the spur called "the Bairo Khind," where formerly stood a gate called the "Bairo Derwaza," and above the ruins of which is the Guard room, we commence the four-mile walk that encircles the fort of Poorundhur. Following this path, we observe on its left slope, at a short distance from the barracks, two native houses, used as slaughter-houses, in the vicinity of which the camp sweepings are daily burned; slightly in advance, and on the same slope, is the Burial Ground, so placed as to be well removed from the camp, having the eastern end of the Upper Fort between it and the cantonment as a break to any malarious miasma. Continuing this walk, which is a broad, well-metalled road, finished by Captain Ker in 1856, and following its many windings, with seats placed here and there on its most picturesque spots, we have on our right the steep southern slopes from the upper fort, crowned with frowning walls and beetling bastions, and covered during the monsoon with many wild flowers, thick brushwood, and the beautiful arrrowroot plant. In the midst of these are many small paths, down which, during the rains, comes tearing and dashing the wild water, falling over the massive rocks of basalt that lie immediately on the left beneath our path, and breaking into many cascades until it reaches the deep ravines below, whence it goes flowing on till it rushes into and swells the Neera, making that stream a turbulent river. On our left we look down on hill and vale, wooded ravines, and the winding Neera, until we reach a spur, the largest of this hill, running in a southerly direction, called by Natives "Bowchee-ke-Mate," and by us "FitzClarence Point," from the fact of the late Commander-in-Chief having used it as a drill-ground for the many details he assembled here. Part of its ample table-land is now used as a Cricket-ground; here is also a small tank which Mahdoo Narain Rao was building, when he precipitated himself from one of the Shenwar Palace windows

in Poona Castle, goaded to do so by the craft and devilment of Nana Furnavees. This point would form a fine site for barracks, dwelling-houses, or any scholastic building. Beetling over the scarp above us, hangs the Futish Bastion before mentioned.

Pursuing the road which now takes a more northerly direction, we arrive at another table-land, almost under the abrupt scarp upon which stands the most westerly bastion of the fort, called Konkani, from which prisoners were hurled (vide page 57). Here may be seen huge and wonderfully balanced masses of basalt, that have been detached and have fallen from the fort sides. From this table-land runs another spur in a south-westerly direction, called by natives "Messal Mate" and by ourselves "Ker's Point." This point, from its extent, and from being sheltered from the east and opened to the west, affords, if possible, an even more desirable site for barracks, houses, &c., than FitzClarence Point. The views from this point are rich and extend as far as the Mahableshwur Range. On this table-land are three small natural tanks, in the solid basalt. The road here takes an easterly direction and follows the windings of the hills, passing two westerly spurs, till we reach that on which the hospital is built, passing through a gate very much broken, and in ruins, called the Konkani Derwaza; from this a wall rises, till it meets the rock on which the upper fort is built, forming the western boundary of the lower fort, above which frowns the Shewdree Burj, and beneath which are two caves, one of which runs in 50 feet, the other 160. In the latter are three chambers; the first about 20 feet from the entrance, is 18 feet in diameter, and 10 in height; the second is reached by a passage 37 feet from the first, and of nearly the same dimensions; while the third, a small room 7 feet in diameter, is 60 feet further in. Through the gateway, we pass to the spur called "Lugan Mokh," or Marriage Mouth, on which the hospital stands; distant about one mile and a quarter from the Rest-House beneath. Leaving the hospital for the present, we follow our road, which takes us through the cantonment, which, as before mentioned, stands on a narrow terrace on the north side of the hill, three hundred feet below the upper fort, flanked on the east by the barracks, and on the west by the hospital, the point from which we now start,

leaving on our right hand a fine tank of solid masonry, called the "Mukarasa Talao," and said to have been built by Mahdoo Rao. Above this is a large commodious bungalow; past one or two bastions on our left with several guns said to have been taken by Sivajee from the Portuguese, past a large quarry, we arrive at the point where the road divides, marked by a small stone temple built, says my informant, by a Lowar, 20 years before the English Raj, which he dates from the battle of Kirkee. Taking the upper road, we pass on our right the commodious, well-built patcherries, ten in number; on our left, four sets of quarters, under one roof, each consisting of one large room, ample bath and dressing accommodation, let to any one who may require Bachelor's quarters, during the hot season, at a daily rent of one Rupee. Below these again is the "Beni Gate," the only gate standing, of the Lower Fort called Beni, because the Beni-walla's (Quarter Master General's) house formerly stood close by it, where now stands a large modern bungalow. Following again the upper path from the patcherries, and near this large house, which is just beneath our road, we come to a small stone temple and well; one of the oldest inhabitants informed me that this temple was built by Nana Furnavees, over the spot where the inhabitants from the neighbouring villages placed the offerings, which they brought to celebrate the birth of Mahdeo Narrain Rao. Such may or not be the case, but the bungalow in immediate advance of it, is built on the site, and with much of the material of the palace of Nana Furnavees. We now reach a fair-sized bungalow, enclosed with a stone wall; this bungalow is the only one on the hill, which faces the west, and consequently is the coolest and best ventilated; where it stands, once stood the palace, in which was born Mahdeo Narrain Rao, and just below it, are two temples built by Abbajee Poorundharee. Following our course through the clean bazaar, consisting of one line of houses, with its few fairly found shops, we reach the eastern termination of the terrace, on which the Cantonment is built, and the "Bairo Derwaza," from which we commenced the circle of the four-mile walk; while before us is the Bairo Khind on which stand the Barracks and Canteen. Immediately below them is a fine tank, the masonry of which was built by Sivajee; it is called by

Hindoos the "Padmati Talao," or Lotus Tank, and by Mussulmans the "Ruzwal Talao." On the north side of it is an open space of ground, on which stands a few mango trees, and where formerly stood a small house in which the late Lord FitzClarence died; this spot has been purchased by his widow, with a view to the erection of a Memorial Church.* This spur, the "Bairo Khind," appears to spring from beneath the Sky-Scarper bastion of the Upper Fort, and, running in a north-easterly direction, to terminate its sweep in the rock on which Wuzurghur is built. On this, the highest and driest spur in this island-like Cantonment, is the site which has been wisely chosen for the Barracks; while at the extreme west, on a bit of table-land, or spur, called the "Luggan Mokh," Marriage Mouth, overlooking a broad and fertile valley, receiving every breath of wind that comes from the west, and remote from any source of malaria, stands the Hospital; such spots would a Roman General have chosen for himself and his Pretorian Cohorts; and where the Barracks now stand, once stood the habitation of him, who in every respect equalled the most sagacious of Roman Generals, the late Sir Charles Napier.

Barracks.

The barracks consist of two buildings for the accommodation

* This ground was found not sufficiently solid for a heavy stone building, and a more eligible site was chosen in a garden near the Beni Derwaza, where the foundation-stone was laid by His Excellency the Commander in Chief on the 23rd of October 1861, within a few days of the seventh anniversary of the death of Lord FitzClarence, who died on the morning of the 29th of October 1854. Sir William Mansfield on laying the foundation-stone spoke as follows:—

"It gives me great pleasure to find that accident has brought me to this hill, just at the time when it suits the plans of my reverend friend Mr. Gell to lay the first stone of the Church at Poorundhur. It is by the liberality of Government, and the efforts of the Right Reverend the Lord Bishop and the Reverend Mr. Gell, that this Church, the erection of which was suggested nearly seven years ago, is now about to be built.

"But though erected chiefly at the expense of Government, it is, I believe, at the instance of the widow of the late Lord Frederick FitzClarence, who died within a few yards of this spot, exactly seven years ago, and is to be considered as a memorial of one of my most distinguished predecessors in the Command of this Army. There was no man who loved British soldiers more, or who strove more sincerely to further their interests, and promote their efficiency: and if it were possible for him, where he now is, to look down upon us here, and see us engaged in commencing on this spot, and in memory of him, the erection of a Christian Church for the Worship of God, it would afford him, we may well conceive, cause for the sincerest gratification and praise."

of 82 men; as they are known by the names of the Chuppered and the Tiled Barracks, I will abide by these in describing them. The chuppered barracks, as its name indicates, is a thatched building, and stands slightly higher than the tiled one, from which it is distant about 100 yards. It faces west, to the influence of which wind it is admirably exposed, while it is partially protected from the east, by a spur which rises a little in its rear. It consists of one long room, with a fire-place at each end, and a verandah running the whole length of the building in its front and rear, and two rooms at each side. The centre room is 96 feet 6 inches in length, 24 feet 6 inches in breadth, 14 feet 6 inches in height of inner walls. Its two side rooms are 6 feet 6 inches wide, 24 feet 6 inches long, 10 feet 6 inches high. They are intended to accommodate 3 invalids each, allowing to each exactly 52 cubic feet of air less than is allowed to the Horse Guards in the Portland-Street Barracks; or exactly 80 feet less than is recommended, as the minimum space to be allowed to each man at home, namely 600 feet: a fact too significant to need comment, and striking enough to create astonishment in any reflecting mind, that in this climate three invalids should be put into a space barely more than deemed sufficient for two healthy soldiers at home. The verandahs are 7 feet 6 inches high, 6 feet 6 inches wide, and 114 feet 6 inches long. The centre room, which is built for 44 men, affords to each 956 cubic feet of air. There is a space of 11 feet 8 inches from foot to foot of each cot; 5 feet is occupied by table and benches placed down the centre of the room, leaving a free passage on each side, between the benches and the feet of the cots, of 3 feet 4 inches. Deducting 4 feet 9 inches for each of the door-ways, of which there are two on either side, there is between each cot 1 foot 5 inches. This room is lighted by six windows opposite each other, in its front and rear, and at each end two windows open into the side rooms. The front or west verandah contains eight windows, and one at its north end, and is entered by a door at its south extremity. On its eastern side, or rear, are seven windows, opening into the verandah, in the centre of which is a door, as there is also at its south end facing a window to the north, like the west verandah. Besides the doors and windows the verandahs are ventilated by tiles tri-angularly arranged. There are three sets to each

window, one over each of the cross beams at the top, and one below each of the lower angles of the windows. None of these windows face those which open into the centre room, but are placed alternately opposite their spaces, by which means a direct current is obviated, while pure air is constantly admitted through the air holes. The floors of the verandahs, centre and side rooms are neither paved, boarded, nor chunamed, but are made of rubble, beaten hard, and cowdunged weekly. These floors are easily broken by the iron casters of the cots, the heels of the men's boots, and the feet of the tables and forms; so much so, as after a few months' wear and tear, to become unlevel and very uncomfortable. The tiled barrack is also a stone building, tiled, facing north and south, and running east and west. It consists of one large and two small end-rooms, with a verandah on its north and south sides, running the whole length of the building. The large or centre room, in which there is a fire-place at the east end, is 49 feet 6 inches long, 23 feet 9 inches wide, and 16 feet 6 inches high. It is intended for the accommodation of 24 invalids, allowing to each 976 cubic feet of air, and an area space of 48 feet. There is a space of 11 feet 5 inches between the feet of the cots, 5 feet of which is occupied by the tables and benches down the middle of the room. So the clear space between the benches and the feet of the cots is 3 feet $2\frac{1}{2}$ inches; while the space between each cot is 1 foot 6 inches, deducting 4 feet 10 inches for the door-way, of which there is one on either side. The remark touching the floor of the chuppered barrack equally applies to this. The verandahs, which run the whole length of the building, are 72 feet 6 inches long, 9 feet 6 inches broad, 16 feet 6 inches high. They are lighted by six windows, and a door at each end; the centre room being lighted by 4 windows and a middle door on each side. The verandah windows and those in the ward are placed opposite to each other, and the tile mode of ventilation is also used here. The end rooms are 23 feet 9 inches long, 9 feet 9 inches wide, 22 feet 6 inches high. They contain 2,671 cubic feet of air, and allow to each man 667. They are lighted by a half-glazed door at the north end, by two windows at the sides, and are ventilated by the tile air-holes. The out-houses consist of a privy, store-room, arms-room, cook-room, and wash-house. These are all constructed of stone quarried on the hill; they run

parallel with the chuppered barrack, and at right angles with the tiled barrack. There is only one privy for the two barracks; it is 24 feet long by 12 broad, and contains 13 seats, two of which have been converted into urinals, there being no accommodation of that sort for either of the barracks: between each of the seats there is a partition wall. This building is lighted by 4 windows, and entered by a door, which leads into it from the verandah at its west end; there is also another door at its south end, which leads out into the spur on which the building stands. All the seats are open. At their rear is a stone wall inclosing a passage, down which is an open drain; this drain is supplied with water from the cook and wash-houses, and into it the urine which passes through the baskets, which are placed half filled with clean straw twice daily, beneath the privy-seats, so that there is a constant stream flowing down the drain, by which means it is kept sweet and clean; this falls immediately from the south end of the building into a small stone trap, whence it is conveyed by a covered drain some distance down the side of the hill, until it reaches the edge of the precipice down which it falls. A constant sprinkling of lime over the urinals and reception baskets, and down the outside drain and about the privy, keeps this building quite free from unpleasant scents. The back of the building is raised considerably by means of high stone foundations at its south end, in consequence of the sudden declivity of the ground there, whilst on the north end it is level with the ground, or only sufficiently raised therefrom. At the south end are the two store-rooms, each 13½ feet long by 13 feet broad. Next to them is the cook-house, 18 feet by 13; and next to this the only wash-house for the two barracks, with a stone floor whose slope is barely sufficient to carry off the water, and a stone bench on two sides of it, on which the basins are placed, and from the rear of which runs a small drain. A great evil in this wash-house is, that the wet state in which the floor always is, strikes both damp and cold to the feet of the washers. To obviate this, I have recommended wooden gratings to cover the whole of the floor; these have been sanctioned, and are being prepared. They are made in wooden frames, so as to be easily taken up when the floor is swept, and are so contrived as not to prevent drainage, but always to afford a dry footing for the washer; this room is lighted by a large window in the centre of

its east wall. Both the barracks are slightly raised, and entered by two stone steps; from their natural position—being built on basalt on the slope of a spur—not the smallest amount of water can lodge during the heaviest rain. Their natural drainage is consequently complete. The Hospital is a stone building, paved and tiled, and facing west; well raised from the ground, and entered by a flight of steps; it contains four wards, each 40 feet 9 inches long, 24 feet wide, 19 feet high, in which is inclosed 22·738 cubic feet of air: this, allowing 12 patients to each ward, gives 1,894 $\frac{10}{12}$ cubic feet of air to each. The cots are, from foot to foot, 11 feet 8 inches apart, 5 feet of which is taken up by the tables and benches down the centre of the room, leaving, therefore, a passage between the feet of the beds and the benches, of 3 feet 4 inches, and giving a space of 3 feet 6 inches between each bed. The west verandah, which runs the whole length of the building, is 160 feet long, 12 feet broad, and, taking in the two ends, allows a free promenade of 250 feet. The four wards—consisting of two middle and two end wards,—are lighted and ventilated by means of doors and windows. The two middle wards, which stand on either hand of the entrance passage, are lighted on the west side by 3 windows and 1 door, and on the east by 1 window and 2 doors. A door from the north end of one and the south end of the other, opens into the end verandah, opposite to a door that leads from thence into the compound. The western verandah, or promenade, is lighted by 18 windows and one centre large quadruple door, 8 feet square. The windows here have the same arrangement, and are of the same size as those in the wards, that is, they consist of an upper or glazed half, and a lower or panelled one, divided by a horizontal bar in the middle; the whole height is 7 feet 4 inches, and the width 4 feet 4 inches. The upper or glass half is 3 feet 8 inches high, by 4 feet 4 inches wide, and opens inwards with two doors, as does also the lower or panelled half: besides these are the two doors already mentioned in the end verandahs. The surgery, which is on the left hand of the door leading into the hospital, is part of the eastern verandah inclosed, and is 20 feet 5 inches long by 12 feet broad. Opposite to this, on the right hand of the entrance, is the room for particular cases, 15 feet long by 12 wide; each of these rooms is lighted by one window. In the rear of the two end wards, and partly of the middle ones, runs

the eastern verandah, from which the surgery and room for particular cases has been built off. The right half of the verandah—that from which the surgery is built off—is 76 feet long by 12 feet wide, and lighted by 6 windows on the side and one at its end, looking due south. From this end also, leads a wash-house 12 feet long by 10 feet wide, well sloped and drained, lighted by one window. The left half of this verandah—that from which the room for particular cases is built off—is 58 feet long by 10 feet wide. From the north end of the west promenade verandah is a passage 51 feet long by 6 feet wide, which leads to the sweepers' store-room, privy, and urinal. They are written as they stand. The privy which is in the centre, describes two sides of a square, is 30 feet in length and 10 feet 4 inches in width. It contains 10 seats, none of them partitioned, and has no ventilation, except by its two doors. The urinal, which is to the right of this, is 11 feet 10 inches square, and has a channel 2 feet wide, running the length of one side, formed by a wall two feet high; this is ventilated by a window in its south end. The sweeper's store-room is the same size as the urinal, and lighted by a window at its west end. The out-houses consist of a guard-room, serjeant's quarters, and a cook-house. Under one roof are the dead-house, grass-room, clothes-room, and store-room. All of these out-houses, with the exception of the grass-room, have paved floors like the hospital. The Female Hospital stands on the same spur as the hospital, and is stone-built and tiled, well raised from the ground, and consists of one centre room 20 feet by 18, and 14 feet high; and two smaller rooms on each side, 12 feet square by 11 feet high. It has a small west and east verandah, into both of which the centre room opens, by means of a door and two windows. From the east verandah, a door opens into each of the side rooms, right and left, which are each lighted by one window. These rooms are not well ventilated; scarcely sufficiently so, to be converted into wards, but might be used for surgery and store rooms; all the rooms are paved and have ceiling cloths. The west verandah has, on its south end, a small washing room, and on the north a privy with two seats. Both these verandahs are of the same length as the centre room, viz. 20 feet; and are 7 feet wide, not sufficiently wide or low to prevent either the morning or afternoon sun, from rendering the centre room, almost uninha-

bitable. The remedy for this will be mentioned, with the suggested improvements to the hospital.* To this hospital there are no out-houses of any kind; these, with the apothecary's quarters, have yet to be built.

There are three bath-chairs, as well as a dhooly, and six bearers, attached to the hospital. These bath-chairs are of the greatest use and comfort to patients, too weak to walk.

Climate and Productions.

In general terms, it may be said that the climate is good, fresh and bracing, and well suited to most European constitutions; having few, or I may say, no tendencies to produce the diseases to which Europeans are prone in India; but is, on the contrary, a powerful agent in the cure or prevention of many of them. It is more temperate than many hill stations, that is to say, the rain-fall is less than most. The hot season is much tempered by the influence of the westerly or sea-breeze. It is far from oppressive, admitting of morning and evening foot exercise with comfort, being cool enough to prevent the heavy perspiration, which in a great measure, nullifies the benefit of exercise; and under the deep shadows thrown by the hill, exercise may be prolonged as late as 9 o'clock in the morning. The cool season is so much tempered by clouds and occasional drizzling rain, as to be free from that extreme dryness which characterises the Deccan plains. This climate is especially suited to the constitution of children, both Native and English, as is strongly confirmed by the absence of any of the epidemic diseases of children, such as Measles, Hooping Cough, Croup, &c., which are unknown on the hill. There are no indigenous diseases found here; of Cholera and Dysentery, the only cases known were imported from the plains. The months of November and December are marked by slight Catarrhs amongst the Natives. There are no sources of malaria, owing principally to the natural facility for good drainage; the nature of the soil; the absence of under-wood; and the sanitary arrangements established. The accompanying Tables show at a glance, the principal features of the climate.

* Since the above was written, two additional verandahs, each 6 feet wide, have been built along the E. and W. sides of the Female Hospital, which obviate the evil mentioned; and a good cook-house has been erected.

TABLE I. showing the Temperature, Range, Moisture, Rain-fall, Direction of the Winds, and prevailing Weather, of each Month of 1860.

Months.	Average range of Temperature.			Range.	Dryness, difference between Dry and Wet bulb Thermometer.	Rain-fall.	Direction of Winds.	Remarks on Weather.
	Maximum.	Medium.	Minimum.					
	°	°	°	°	°	ins.		
January	73	67·5	62	11	15·0	..	SE. E. NW. W.	Cold and pleasant. Winds at night.
February	77	72·5	68	9	13·0	..	E. NE. W.	Clear; occasionally cloudy.
March	82	77·0	72	10	18·0	..	E. SE. W. NW.	Fine; westerly winds at night.
April	83	77·0	71	12	17·5	·44	E. NE. NW.	In general clear, occasionally cloudy; thunder-storm and rain.
May	84	77·5	71	13	12·0	1·52	NE. NW. W. SW.	Clear ditto ditto
June	74	70·0	66	8	4 5	16·47	SW. NW.	Occasional fogs; cloudy; thunder-storm and heavy showers.
July	67	66·0	65	2	2·0	11·54	SW.	Cloudy; rain and fog.
August	68	66·0	64	4	2·0	9·19	SW.	Ditto ditto latter part clear.
September	70	67·0	64	6	2·0	9·42	SW.	Mornings and evenings misty; days clear; heavy showers occasionally.
October	74	70·0	67	7	5·5	7·17	NE. E. NW.	Cool and pleasant; occasionally overcast with a few heavy showers.
November	70	66·0	62	8	11·5	..	E. NE.	Fine and pleasant; cold mornings and evenings; high winds at night.
December	71	67·0	63	8	14·0	..	NE. SE.	Fine; occasionally cloudy, with drizzling rain.

TABLE II. showing the average Temperature, the Dryness, the Rain-fall, the Direction of the Winds, and the Weather for Nine years, from 1852 *to* 1860.

Months.	Average range of Temperature.			Range.	Dryness, difference between Dry and Wet bulb Thermometers.	Rain-fall, average for 9 years.	Direction of Winds.	Remarks on Weather.
	Maximum.	Medium.	Minimum.					
	°	°	°	°	°	ins.		
January	74·0	67·0	60·0	14·0	11·5	0·3	E. SE. NE. NW.	Fine; cold; boisterous winds.
February	73·3	68·4	63·5	9·8	12·4	0·21	Variable.	Ditto occasionally cloudy; moderate breeze at night.
March	83·6	75·3	67·0	16·6	17·3	0·16	NW. W.	Fine throughout; noon warm; continual breeze morning and evening.
April	85·8	77·4	69·0	16·8	17·9	0·58	N. W.	Mornings and evenings pleasant; day close; occasionally cloudy with some rain. A breeze during the night.
May	84·2	76 1	68 0	16·2	13·1	4·77	NW. W. SW.	First part clear; days warm, cloudy, with showers of rain; boisterous winds at night.
June.....	75·5	70·2	66·0	9·5	4·2	9·74	SW. W.	Foggy and damp with frequent showers of rain; occasionally clear.
July	70·0	67·4	64·8	5·2	1·9	20·10	SW. W. NW.	Ditto squally; frequent showers; sunshine occasionally.
August.....	69·0	66·2	63·5	5·5	2·2	10·26	SW. NW.	Ditto with continual showers; some days dry & pleasant.
September	71·1	67·1	63·1	8·0	2·6	8·16	SW. NW.	Misty, with constant drizzling of rain; some days sunshine and pleasant.
October	75·6	70·4	65·2	10·4	7·4	5·59	SE. E. NW.	Mornings misty; days clear and pleasant; at times cloudy with some smart showers and thunder.
November	73·7	67·7	61·7	12·0	10·2	0·73	E. SE. NE.	Clear and fine; cold, boisterous winds.
December	72·0	65·8	59·7	12·3	9·8	0·91	E. NE.	Fine; cold, high winds; sometimes cloudy and still, with a light shower.

TABLE III. showing the Rain-fall of Six years, as registered from 1855 to 1860 inclusive, with the Average.

Months.	1855		1856		1857		1858		1859		1860		Inches.	Cents.
	Inches.	Cents.	Inches.	Cents.	Inches.	Cents.	Inches.	Cents.	Inches.	Cents.	Inches.	Cents.		
January	..	..	..	..	..	30	..	..	..	..	..	..		
February	..	58	..	..	..	..	..	16	..	..	..	..		
March	..	78	..	..	..	8	..	..	..	20	..	..		
April	..	25	..	10	..	72	..	68	1	8	..	44		
May.....	..	..	4	21	6	94	5	75	1	45	1	52		
June	6	64	3	18	7	95	6	75	5	11	16	47		
July.....	31	85	17	57	9	63	11	92	19	58	11	54		
August	4	35	12	39	2	80	9	11	6	2	9	19		
September	8	80	6	13	4	29	3	67	16	1	9	42		
October	8	65	..	71	4	31	3	87	..	..	7	17		
November	..	..	..	20	2	18	1	87	..	..	..	..		
December	..	28	..	27	..	..	..	..	..	..	..	..		
Total..	62	55	44	70	69	20	40	78	48	43	55	75		
Average Total fall for six years....													53	57

TABLE IV. showing the comparison between the Wet and Dry bulbs of the Thermometer at Poorundhur and Poona, for Six Months, between the 1st October 1859 and 31st March 1860.

	1859			1860		
	October.	November.	December.	January.	February.	March.
Morning Observations.						
POONA.						
Of the Air	75°	77°	69°	67°	74°	79°
Of the Wet bulb	68	67	60	57	63	65
Difference between Dry and Wet bulb.	7	10	9	10	11	14
POORUNDHUR.						
Of the Air	67	67	60	62	68	72
Of the Wet bulb	62	56	53	50	57	55
Difference between Dry and Wet bulb..	5	11	7	12	11	17
Difference in favor of Poorundhur	2	..	2	...	..	..
Difference in favor of Poona	..	1	..	2	..	3
Evening Observations.						
POONA.						
Of the Air	82	84	78	79	86	91
Of the Wet bulb	70	70	64	63	67	69
Difference between Dry and Wet bulb..	12	14	14	16	19	22
POORUNDHUR.						
Of the Air	72	78	76	73	77	82
Of the Wet bulb	68	59	59	55	62	63
Difference between Dry and Wet bulb..	4	19	17	18	15	19
Difference in favor of Poorundhur	8	..	..	..	4	3
Difference in favor of Poona	..	5	3	2	..	..

From Tables I. and II., it will be perceived that the hill is more or less enveloped in fog during the months of June, July, August, and September, from about the middle of the former to about the middle of the latter month; the intensity being most marked in the middle months, viz. July and August. These also, by reference to Table II., will be found to be the months, when the rain-fall is heaviest; and the smallest difference

discoverable, between the dry and wet bulbs of the thermometer.* The months of July and August, from the amount of rain, which nine years' average shows to be in the former 20 inches, and in the latter 10, cannot be otherwise than damp and foggy, and to a certain extent depressing, in the ratio that out-door exercise is denied, amusements curtailed, and the mind in which no store-house has been erected thrown back to feed on itself. I shall meet these objections severally.

Out-door exercise denied.—The experience of Captain Ker, who has now seen five monsoons on the hill, and my own, tends to prove that there is scarcely a day during the months in question, when at some time or other, between sun-rise and sun-set, a walk may not be taken.

Amusements curtailed.—A well-stocked Library, with many of the English papers and periodicals, illustrated and otherwise, and two local papers; a separated room for a Bagatelle Board; Back-gammon Boards; a free supply of Chess-men, Draughts and Dominos; two well-built, covered-in Skittle sheds; Quoits; Amateur Theatricals or Concerts, twice a month; and an occasional game at Cricket on the plain at the foot of the hill, when the weather permits, leaves little to be said for curtailed amusements, or for fear that the mind should be left to feed morbidly on itself. As to the belief that the climate is gloomy and depressing, in consequence of the fog hanging so long over the hill as to become stagnant, I would say that stagnant the atmosphere never is; dense and heavy as the fog may be, it is ever in movement, ever carried on by a never-ceasing westerly wind, and frequently broken through by the ever-struggling sun; these, the wind and sun, are two enemies, that, though never quite victorious, are perpetually antagonising the fog.

I conceive that this hill station, from its position, by which in a great measure it is protected from the heavy burst of the monsoon, and its declivity, by which no water can remain on

* I am aware that an impression is abroad, that the months of July and August are so enveloped in fog, as to hide from sight an object but a few paces removed: also that the monsoon climate is so dull and depressing, owing to its stagnation, as through the mind, so to act on the body as to retard its progress towards health. The experience of the past year,—whose rain-fall has been beyond the average of six years,—shows that this is far from being the case.

the ground, is a good Monsoon Sanitarium for patients who, during the hot weather, have been struggling in the plains; especially those cases of malarious poison, where the constitution has been so debilitated by constant febrile attacks, as to be powerless in resistance, but in whom no organic lesion is great. I consider that this hill station, from the very temperate nature of its atmosphere, which is ever in movement, has a peculiar advantage over Bombay and the Sea-coast, during the monsoons; for while the coast atmosphere is hot and moist, Poorundhur is cool and moist; and while the one eliminates from the skin a fluid which cannot evaporate but accumulates on the surface, the other allows of no such surface action, but brings actively into play the kidneys, which have the effect of extracting carbonic acid from the system. Lastly, over the two localities just mentioned and the plains, Poorundhur has the advantage of small variation in the thermometer, the greatest being—looking at Table No. II.—in March, where the range is 16° 6′, a significant fact, for, to the smallness of variation, health is as much due as it is to moderateness of temperature; and the more sudden the changes from heat to cold, and *vice versâ*, the more powerful the influence for evil on the system. This Sanitarium is especially good, because its elevation is sufficient to remove the European above the range of malarious fevers, such not being indigenous, and is not so great as to place him within the influence of an exhausting and dangerous diarrhœa, as neither cholera, diarrhœa, nor dysentery are known amongst the native inhabitants. Table IV., while it proves the climate of Poorundhur to be, between the months of October and March, slightly moister than that of Poona, also shows a considerable difference in favour of Poorundhur, as regards its coolness; so that while the temperature at Poorundhur is by many degrees lower than it is at Poonah, it is also slightly moister. The water supply of this hill is good and ample; in the upper fort are numerous under-ground tanks, and in the lower many wells and two large tanks. No free or fixed acid, lime, or minerals have been detected in the water.

The Botany of Poorundhur is most marked in the first three months of the monsoon, when the hill side is covered with a

variety of wild flowers, among which may be seen the cobra or snake lily of Anglo-Indians, one of the Arum family, the *Aroideæ Arisæma;* the wild arrowroot, and three kinds of salep, several kinds of ferns, and an endless variety of grasses shoot up with that rapidity which ever marks Indian vegetations. In September and October the red and white balsams cover with a flush of colour the hill slopes, crawling amid the stems of which may be seen the wild colocynth, *Citrullus Colosynthis*, in such abundance that large quantities of the extract might easily be obtained for public use and exportation; during these months the sight is gratified by that lovely plant of deep-blue colour the *Delphinum Dasycaulon* which the "Bombay Flora" mentions as flowering near Jooneer, and being found also in Abyssinia; while earlier in the year, during the months of March and April, studding here and there the valleys and hill slopes, the bombax, from its leafless stem and pink flowers, gives forth the silken cotton to the passing breeze. On the hill slopes near the valleys, and wherever a patch of ground or small piece of table-land can be reached by the plough, the native cultivators raise mahwee, warree, sarvee and other grains; and in the season, patches of rice may be seen marking the sides of the once furious torrent course, into whose bed only sufficient water now drains from the mountain sides for irrigation. The Mango, *Jumbal* and *Ficus Glomerata* are the only trees of any importance here, and these are very few.

Medical History of the year 1860.

TABLE No. I.

Remained on 1st January 1860.	Arrived during the Year.	Discharged.		Died.	Remaining, 31st Dec. 1860.
		Fit for Duty.	Unsuited to climate and Invalided.		
60	167	104	23	3	97

From this Table it is seen, that out of the aggregate number 227—which number is formed by 60, who remained on the

1st January, and 167, who have arrived since—104 have been returned to duty; 23 have been sent down, as cases unsuited to the climate; 3 have died, and 97 are still remaining. Of these 97, 60 arrived recently, viz., since 4th November. Of the 3 deaths, one,—that of a corporal of the 56th,—occurred on the 5th November, the day after his arrival on the hill. It was a case of Hydrophobia, the result of the bite of a rabid jackal, received two months previously at Sattara, in which station he had suffered much from intermittent fever. He was a muscular, well developed man, of sanguine temperament, and, as a *post mortem* proved, free from all organic derangement. At the time of his arrival, a strong, cold, east wind was blowing, and the Thermometer was some 7° or 8° lower than at the Rest House at the foot of the hill; he had walked fast and heated himself by so doing, and became, as he reached the summit, exposed for the first time to the influence of the wind, which proved to be the exciting cause of the Hydrophobia. Of the other two deaths, one was of a man whose constitution had for years past been broken and undermined by venereal poison, and was in fact one of the cases peculiarly unsuited to the climate of Poorundhur; as was also the third case, which resulted from organic disease of the walls and valves of the heart. Both of these cases occurred within three months of my taking charge.

The 23 cases sent down as unsuited to the climate were, *Febris Intermittens* 5, implicated with either Hepatic or Splenitic lesion; *Dyspepsia* 2, dependent on Visceral changes; *Hepatitis Chronic* 1; *Rheumatism, Chron.* 3, in all a *syphilitic cachexia* was marked; *Paraplegia* 1; *Hemiplegia* 1; *Splenitis* 1; *Morbus Cordis* 1; *Morbus Brightii (Nephritis)* 1; *Paralysis Agitans* 1; *Dysenteria Chron.* 2; *Debilitas* 2, both had marked *Phthisical* symptoms; *Syphilis Consecutiva* 1; *Palpitacio* 1.

Out of the 184 cases treated, of all classes of disease, the very large proportion of 105 were fever cases; the majority of which were in men who shared in the late campaign. And here I would remark, as it speaks volumes for the salubrity of the climate, that it is most gratifying to observe, how rapidly all cases of uncomplicated fever cast off the debility which has

been devouring them, and gain healthy looks from the breezes that are ever blowing over this hill. Daily almost, may be marked the thin pale cheek losing its pallor and gaining rotundity; and the legs that were barely able to carry their owner beyond the barrack or hospital compounds, bearing him after a short time to the Cricket ground, where before long, he who, on his arrival was scarcely able to walk, may be observed entering eagerly into the sport, with the elasticity of a mind and body recently relieved from a load of debility; thus rapid and marked is the stride to recovery, in all cases of fever, uncomplicated with either splenitic or hepatic lesion.

On the 4th November last, 32 men from the 56th Regiment arrived from Sattara; all were cases of intermittent fever, with only slight hepatic or splenitic derangement, but marked by great debility and muscular loss. Beneath, I give a table showing their aggregate weight on arrival; their weight at the present time; their aggregate weight gained; and the average weight gained by each man.

Aggregate weight of 32 men on arrival.		Present weight of all.		Aggregate weight gained by all since arrival.		Average weight gained per man.
Stone.	Pounds.	Stone.	Pounds.	Stone.	Pounds.	Pounds.
305	7	326	3	20	10	9

From the 4th November to the present time, a period of less than two months, each man has increased upwards of 9 lbs. in weight. As this very surprisingly rapid improvement in 32 cases of intermittent fever has taken place in two of the months generally considered unsuitable to such cases, we can but conclude that much is yet to be learnt respecting the salubrious and insalubrious months at Poorundhur. From much attention given to this subject, and a careful watching of the fever cases under my charge here, since April last, a period comprising the three condemned monsoon months, and two of the equally condemned autumn months, I am so far strongly inclined to the belief, that there is no part of the year when such cases may not improve at Poorundhur; but the further experience of the coming year will furnish more statistical evidence.

The next largest item of cases occurs under the head of "Other Diseases;" of these, 21 have received treatment. Many of them are cases peculiarly unsuited to the climate. Six of those sent down on this account are included under this head; as also are two of the three who died.

The next largest class of cases—viz., 13—is included under the heading of "Diseases of the Stomach and Bowels." Of these, six were cases of Dysentery, three chronic, and three acute. Of the three chronic cases, I must observe that they consist of but one patient, whose three admissions are thus returned. This patient was a man of the late Company's Army; had been many years in India, and had suffered much from fever and several severe attacks of dysentery, attended by much hepatic congestion, and internal hæmorrhoids; he was sent down to Poona as one of the cases unsuited to this climate, and has since, I believe, been invalided. Of the three acute cases, one arrived in April and was discharged from the hill, in June, cured. The other two cases are still here, daily improving. Both had suffered much from intermittent fever and diarrhœa previous to their arrival.

Under the head Dyspepsia, 4 cases have received treatment, two of which have been sent down as unsuitable to the climate. In one case, that of a man who had suffered much from fever with enlarged liver, there was constant pain about the epigastrium, nausea, vomiting, loss of appetite, obstinate constipation, and great emaciation. In the other case, that of a man who had suffered for some years, there were frequent febrile symptoms, attended more or less with ague, a relaxed throat, costive bowels, loss of appetite and palpitation, and slight enlargement of the spleen. In this case the relaxed throat and dyspeptic symptoms were due in great part to smoking. Of the other two cases, one is well, and only waiting his transfer to the Police force; his was simply a case resulting from a debilitated constitution. The fourth, like the second, also a great smoker, is improving, and his improvement is especially due to his having to a great extent given up smoking. I would here remark, that simple dyspepsia, the result of a debilitated constitution, or of chronic irritation of the mucous membrane, or resulting from the abuse of tobacco, does well in this climate. But where it is the

sequel of fever, combined with either splenitic or hepatic derangement, where also it is the precursor of Phthisis, no good can be expected from a residence here.

Nine cases of Venereal affections have been treated. Of these, 8 are of *syphilis consecutiva,* one of simple bubo, which healed after short treatment. Of the 8 cases of *syphilis consecutiva,* one, a very cachectic and much emaciated patient, died. One was discharged to the plains as unsuited to the climate, and has since been invalided. Of the 6 cases remaining, one will have to be sent shortly to the plains, having derived all the benefit from this climate that it can give, in whom the syphilitic taint is very deep, and whose admission three times to the hospital, takes three from the number that appears in the Table. Of the other three, actually two patients, for one has been admitted twice, both are now convalescent. From these 8 cases I am inclined to think that very little, if any, benefit may be expected from this climate in cases were the syphilitic poison has taken firm grasp of the system; but that where the virus is recent, and the constitution but slightly under its influence, some benefit may be looked for.

Eight cases of diseases of the liver have been under treatment; 1 acute, 7 chronic. The acute case occurred in a man who had been suffering from frequent attacks of fever, and it yielded readily to active treatment. He is now suffering from dyspepsia. Of the 7 chronic cases, in fact only five patients, one has been invalided, and the other four are still on the hill nearly convalescent. All these cases were here during the monsoon, and all, with the exception of the one case invalided, have improved. In that case, there was considerable induration and enlargement of the liver, with great tenderness on pressure. The patient was pale and anæmic in appearance, and had suffered much for some time from a dull heavy weight in the right hypochondrium, which was increased by lying on the left side. He had never been a hard drinker, was 33 years of age, and had completed 17 years' service; he had experienced a great deal of marching about in Central India, during which he had suffered much from fever. On a review of these cases, I am led to think that good may be derived during the

monsoon months, in cases of Hepatitis in which the substance of the organ is not much implicated, where the constitution is not depreciated, and where the patient is young: that, on the other hand, where the disease is of some standing, so as to affect the substance of the liver and there is a cachectic taint in the system, this climate at all periods of the year has an injurious effect.

The following table shows the number treated, cured, died, sent down as unsuited to the climate, and remaining on the Hill since the establishment of this Sanitarium in 1852:

Treated.	Cured.	Died.	Sent down as unsuited to the climate.	Remaining on the Hill.
1,929	1,474	29	329	97

The percentage of cured to treated is 76·4; of died to treated 1·5. Of cases unsuited to the climate 17·0. The latter large percentage shows how important it is, that cases sent for cure to this Sanitarium should be well and carefully selected, in order that the full benefit of the climate may be obtained, and that the very large proportion of cured to treated may be still further increased. Nothing may better illustrate this than a reference to the very rapid improvement evinced in a batch of admirably selected cases sent from Sattara in November last, of whom more particular mention has been before made. I would therefore express an earnest hope that all cases of fever, complicated with disease of the substance of either the liver or spleen; all in whom syphilitic poison has taken deep root, and is accompanied with mercurial cachexia; all rheumatic cases where the cachexia is severe and syphilitic; affections of the heart where organic disease is present,—may not be sent to this Sanitarium, as not only is unnecessary expense entailed on the State, and room which might be occupied to great advantage worse than wasted, but all hope of the cure of such cases is not only delayed, but not unfrequently destroyed, by the aggravation of disease in an unfavourable climate.

HYPTALGIA OR NEURALGIA OF THE LIVER.

BY ASSISTANT SURGEON W. J. MOORE, M.D., L.R.C.P. Edin., &c.

Presented August 1861.

Hyptalgia, Neuralgia of the Liver, Nervous pain of the Liver, or, as it has been designated, Rheumatism of the Liver, has not been discussed by any of our prominent authors who have written on the Diseases of India. Thus, on referring to Annesley's Works, both large and small, we do not find anything on the subject of neuralgia of the liver, although many pages are devoted to functional derangements of the organ. Again the same author, in his "Sketches of the Diseases of India," is silent on the subject of hyptalgia. The volume of Johnson and Martin does not afford any information on this disease; and the later edition of the same work, published with additions by Sir Ronald Martin, is equally silent on the point, although increased secretion of bile, torpor of the liver, &c., are prominently brought forward, and although the latter portion of the work is expressly devoted to a consideration of the "Diseases of Europeans returned from Tropical Climates." This is still the more surprising, as I believe Europeans returning from hot into cold zones are very likely to become the subjects of this affection. Morehead says nothing on the topic of neuralgia of the liver, unless the remarks found in Volume II. Page 122, under the head of 'Hepatitis in females and children,' might be supposed to refer to neuralgia. Dr. Morehead writes—"That acute pain relating to the hysteric diathesis and simulating acute inflammatory disease, may be present in the female is a familiar fact." And again—"That acute pain in the hepatic region in anæmic females in India has often been injudiciously treated as hepatitis is an undoubted fact." Although the pains

referred to in the passages quoted, are probably neuralgic, it is not exactly that character of irritation, which I am about to describe under the term neuralgia of the liver. Dickson in his book entitled "On the prevalent Diseases of India" (a volume deserving a better fate than the general neglect to which it appears condemned) remarks—"I have had to treat some troublesome cases, which might be appropriately termed rheumatism of the liver. The patients complained of pain in the right hypochondrium, which went away and returned at no particular time." Continental authorities (including the latest volume on diseases of the liver) have not, I believe, noticed the subject of neuralgia of the organ. Watson, Elliottson, and Hooper are alike silent regarding the affection. Dr. Copland is, I think, the only one among our Medical authors who devotes even a paragraph to the malady; but in his Dictionary under the article "Liver," a very faithful, although too brief, account of hyptalgia may be found. The symptoms of this affection are as follows: slight uneasiness or sense of weight in the right hypochondrium, often so trivial, indeed, as to be forgotton when the mind is occupied. Occasionally this pain is absent for a day or two, and returns without any assignable cause. Sometimes sharp twitches of pain resembling pleuritic "stitches" are felt, more rarely they are stabbing or lacinating like acute pleurisy. There is also uneasiness in the shoulder which feels *tired* as though from continued action. Lying on the right side will often relieve both the hypochondrium and the shoulder. Cold, as the outer atmosphere of the winter season in England, often increases or excites the pain, which is frequently immediately relieved by entrance into a warm room or a seat near the fire. The tongue is generally clean, the appetite good, and all the excretions healthy. The mind of the individual affected often dwells on the uneasiness, and he is in constant dread of some serious disease supervening. The hypochondrium is also frequently reported tender, but examination does not confirm this, or in fact detect anything unnatural. The countenance also, instead of exhibiting the unmistakable signs of "liver," is generally healthy, and the conjunctivæ without sallowness. This is a description of pure and simple hyptalgia, but I believe that neuralgic

pains are frequently present when the liver is affected with chronic disease, especially cirrhosis, or small insiduous abscess. In fact, on some occasions the symptoms I have noted are the only *recognisable* results of hepatic suppuration; the abscess perhaps being converted into a hard cheesy substance, and remaining dormant during the whole life of the individual. The affections for which hyptalgia is liable to be mistaken are—

1. Pleurodyne.
2. Muscular rheumatism.
3. Hysteria; comprising those peculiar hypochondriac pains experienced by women at the "change of life."
4. Abscess of the liver.
5. *Partial* congestion of the liver.
6. Chronic inflammation of the liver.

The affections with which hyptalgia is sometimes co-existent, but which can scarcely lead to error of diagnosis, are—

1. Congestion of the liver.
2. Torpor of the liver.
3. Some forms of abdominal irritation.
4. Dyspepsia.
5. Cachexia.
6. Gout.

1. The diagnosis between hyptalgia and pleurodyne is easy. Pleurodyne is a common affection, hyptalgia is not. Pleurodyne is chiefly found as a complication of functional diseases of young females especially; occurring during the progress of amenorrhœa; menorrhagia; leucorrhœa; and chlorosis. Hyptalgia generally attacks the male subject, and those who are residing in, or have returned from, tropical climates. Lastly, pleurodyne generally occurs on the left, hyptalgia always on the right side.

2. The diagnosis of neuralgia of the liver from muscular rheumatism is perhaps not quite so obvious, although not readily admitting of error. Muscular rheumatism frequently occurs after a common cold, hyptalgia does not. The pain of muscular rheumatism is increased by motion, by percussion, or by the sudden removal of pressure; hyptalgia is not affected by either. In some cases of muscular rheumatism, the pain is augmented by warmth; hyptalgia is always relieved by the

same agent. Muscular rheumatism of the side is most frequently accompanied with pain in other muscular or fibrous structures; hyptalgia is always confined to the same quarter.

3. Hysteria; comprising those peculiar hypochondriac pains experienced by women at the "change of life." Hysteria, as it is capable of simulating any other disease, may also readily take the guise of hyptalgia, but in most instances the character of the accompanying symptoms, as the globus hystericus, the limpid urine, the accumulation of flatus, and perhaps the occurrence of paroxysms, would sufficiently establish the nature of the affection. Of course it is in the female subject that the hysterical manifestations are most prevalent, and therefore more likely to take the form of hyptalgia; but it should be recollected that hysterical phenomena may be present in the male. Of this I have seen several well-marked instances, the most striking of which occurred some years since in the Queen's Hospital, Birmingham, under the care of Dr. David Nelson. In this case the globus, the limpid urine, hysterical paroxysms, hysterical peritonitis, and finally retention of urine (the latter on several occasions) were as clearly developed as though occurring in the other sex. It is, however, those peculiar hypochondriac pains which so frequently attend that critical period of woman's existence, generally termed the "change of life," which are most likely to be mistaken for genuine liver affection; or for that particular disorder under consideration. The age of the patient and the state of the uterine functions with the presence, or the reverse, of those symptoms which indicate the condition called "Mimosis Inquieta," would sufficiently indicate the nature of the ailment.

4. Abscess.—Suppuration occurring after hepatitis cannot of course be confounded with hyptalgia, but as regards obscure and insiduous abscess the case is widely different. It is a well known fact that deep-seated, or, as it has been termed, "Suppurative Inflammation" of the liver, may run its course without any urgent symptoms; without previous fever; without signs of inflammation or of congestion; in fact, without any *recognisable* symptoms at all. At other times there is a vague sense of uneasiness or obtuse dull pain; a slight sense of weight or oppression; more

or less, according as the disease is centred in the interior or located towards the exterior of the organ. These anomalous feelings, perhaps, together with slight cough and scanty urine, are signs too often scarcely appreciable by the doomed individual, or if observed, considered too trivial to induce application for medical aid. "Often it is not until the tumour occurs, with rigors and cold sweats that the serious nature of the disease is understood." Budd, Martin, and others, give instances of this nature. It also appears indisputable that abscess may slowly form, become encysted, and perhaps partially absorbed; and so remain for months or years, giving only occasional and often obscure indications of its presence. Indeed Copland remarks—"A person after being resident in India cannot be sure whether an abscess exist in his liver or not;" and Dickson states, "I have known patients die with abscess in the liver, who never in life had either pain of side or the slightest bilious tinge of the conjunctivæ." Such being acknowledged, it must be allowed that the symptoms of abscess, may very readily be mistaken for mere hyptalgia. In some instances the slight cough, the scanty urine, and perhaps the almost imperceptible evening hectic, will guide to a correct diagnosis. When these latter symptoms do not exist, anomalous sensations in the right hypochondrium must always be regarded with a certain amount of suspicion. It has been pointed out by Brown-Sèquard in one of his late lectures, [1] that an irritation starting from one point in the brain (inflamed or congested), like an irritation commencing in various membranes of the viscera, may act on some part of the encephalon, producing there an alteration, which again induces its results (as anæsthesia, epilepsy, &c.) Hence partial alterations in the structure of the liver, or gall bladder; or even of the other abdominal viscera, as will be presently noticed: hence abscess may, it is to be presumed, excite neuralgic pain in some other part of the diseased organ even although the abscess itself be painless. If, however, months elapse during which period the individual affected with neuralgic, or seemingly neuralgic pain in the liver, enjoys good health, and perhaps even gains flesh; we are then justified in concluding that the ailment is nothing more than 'nervous,'

[1] Lancet, July 6, 1861.

whatever that term may be considered as signifying. At all events we are right in relieving the patient's mind by declaring that only a remote possibility of the formation of abscess exists.

5. Partial Congestion.—I use the term *partial* here, because it cannot possibly occur that a case of general congestion of the liver could be confounded with hyptalgia. When, however, congestion is partial, by which I desire to imply congestion of a lobe or portion of a lobe, and when confined to the hepatic venous circulation (or to the venæ cavæ hepaticæ) the uneasiness experienced much resembles hyptalgia. First, because partial congestion may, by the same reflex action already adverted to when treating of abscess, cause pain in another and healthy portion of the organ; and secondly, because, from the hepatic venous system not being so well supplied with nervous influence as the portal circulating system, (no nervous plexus being found to accompany the venæ cavæ hepaticæ,) congestion of the former part—passive congestion—would give rise to more obscure symptoms. Both these affections, hyptalgia and partial congestion of the liver, occur principally in the cold season of the Indian climate, and to returned Anglo-Indians in the winter weather at home; and it is perhaps impossible to say when a person complains of anomalous sensations in the right hypochondrium during such periods,—and when none other signs or symptoms are to be detected,—if such sensations are due to slight or partial congestion, arise from reflected irritation, or are simply nervous, the latter term being merely a convenient mode of expressing the existence of *pressure or irritation*, from some obscure cause, on the nervous filaments. Alterative medicine, however, will generally relieve the former, but has little or no effect on the latter. That is to say, the exhibition of appropriate remedies will remove congestion, but it will not remove pressure from organic alteration of structure, unless in exceptional cases, and after a lengthened period.

6. The same remarks which have been just offered with regard to partial congestion, apply to obscure *partial* chronic inflammation. If general, it would appear to induce neuralgic pain chiefly by simple pressure. It now remains briefly to men-

tion the ailments with which hyptalgia may be co-existent, but for which it cannot readily be mistaken; and from the preceding it will doubtless be admitted that nervous pain in the liver may co-exist with—

1*st.*—General congestion.

2*nd.*—Torpor (induced by congestion). And it is only as these conditions assume a less decided and acute character that they can possibly be confounded with hyptalgia.

3*rd.*—Some forms of abdominal irritation occasionally evidence themselves by the excitation of hepatic neuralgic uneasiness. Reasonable doubt cannot remain that irritation of one division of the sympathetic will induce characteristic pain in another organ supplied by the same or communicating nerves. Hence accumulations in the bowels, dysenteric ulcers, herniæ, hæmorrhoids, &c., are sometimes found to excite hepatic pain. The existence of such causes are readily diagnosed by their respective symptoms.

4*th.*—In the same manner dyspepsia, although it cannot be mistaken for hyptalgia, is, in one or other of its protean varieties, frequently combined with the latter. It is not an uncommon occurrence for hypochondriacal dyspeptics to complain of anomalous pains in the region of the liver, which, in the absence of all symptoms of functional or other disease of that organ, cannot be otherwise regarded than reflected or hyptalgic.

5*th.*—Also with respect to cachexia and especially the "cachexia loci" of India, it sometimes occurs that the subject of this deterioration is continually suffering from some description of hepatic uneasiness for which no adequate reason can be assigned in relation with the action or condition of the liver. Brown-Sèquard however states, that many of the so-called nervous diseases, generally supposed to originate in the encephalon, are due to alteration in the quantity or quality of the blood, and there appears no sufficient reason why, on special and particular occasions, such as the excitement of the hepatic structure by heat, and its subsequent exposure to cold, co-existent alteration in the condition of the blood should not excite nervous affection in the liver.

6th.—Gout. In like manner may not the "materies morbi" of gout, the urate of soda demonstrated by Dr. Garrod to exist in the blood of gouty subjects, be translated to the liver in occasional instances, and form one variety of "irregular," "lurking," "masked" or "atonic" gout? Gouty persons, as is well known, are subject to a variety of ailments which, as Watson truly observes, "spring from the same fountain as the well marked paroxysms"; such being derangements of the heart and lungs; derangements of the brain, as threatenings of apoplexy and palsy; derangements of the abdominal viscera and of the nerves. Accordingly those anomalous hepatic sensations and hypochondriacal feelings so frequently experienced by individuals subject to gout may, with good reason, be referred to irritation of the hepatic nervous filaments, arising from the morbid condition of the diseased blood. This theory, however, cannot be further pursued within the limits of the present paper, otherwise the same diagnosis might be asserted with regard to hypochondriac uneasiness (without symptoms of congestion or fulness) occurring in a gouty diathesis, which I formerly heard an eminent provincial physician maintain to be the "fons et origo" of urgent dyspnœa taking place in a subject of similar habit, viz. the local deposition of gouty material (epithelium in this particular case in the smaller ramifications of the bronchial tubes). And indeed the patient being treated for gout instead of bronchitis or asthma, made a speedy recovery. The causes then of neuralgia of the liver appear—from a consideration of the foregoing,—those of the same affection occurring in any other portion of the frame; as in the structure of the heart, in the stomach, in the eye, the sciatic or other nerves, either of common sensation or of organic life. What may be the precise *nervous* change inducing neuralgia, is still an open question; but we know that inflammation of the neurilemma will at times excite acute pain. It is also equally a fact, that irritation of the extremity of a nerve will give rise to various sensations, reflected or otherwise, just as has been noticed when treating of abscess, partial congestion, chronic inflammation, &c., pressure or irritation near the root or in the course of a nerve will excite the same results. Also in other instances we have what cannot be more *readily* designated than

by the term "Sympathetic Neuralgia," examples of which are pain in the shoulder, so common in affections of the liver; and pains in the upper arm in certain cases of diseased heart. These again, however, are reducible to the class of reflected pains, probably of the sympathetic ramifications; or, as Brown-Sèquard observes, "an irritation starting from one point and producing an alteration elsewhere," whether in the encephalon, the liver, or other organ. As already noticed, neuralgia may be a consequence of a debilitated state of system, evidenced by its frequent occurrence during prolonged lactation; long continued and excessive discharges; exhaustion from loss of blood; and other causes inducing anæmia and cachexia, particularly from malaria. Although it is scarcely possible to give ocular demonstration of the existence of nerves in the interior and minute structure of the liver, still, knowing that nerves do enter the transverse fissure with the vessels, reasoning from analogy,—allowing that all parts endowed with sensibility must be supplied with nervous power,—knowing also that the smallest point cannot be introduced into the cutaneous surface without causing pain, where also nerves are not visible,—it would be absurd to deny the existence of nerves in so important an organ as the liver. Thus we can readily imagine that the hepatic plexus round the artery of the gland, and the filaments derived from the right phrenic and pneumogastric, (the latter nerves of animal, the former of organic life,) ramify through the minute structure, accompanying the vessels in their divisions and subdivisions of vaginal, interlobular, and lobular branches. It has been already remarked, that abscess may form in the liver without the slightest recognisable symptom, and it, therefore, cannot be a matter of surprise, that chronic inflammatory thickening of Glisson's capsule, may take place without the most remote indications of such alteration. This insiduous change, as is well known, may lead to enlargement of the organ, as is most frequently seen in this country; or it may induce the opposite effect of cirrhosis and atrophy, both conditions resulting in *pressure* on nerves and arteries, and giving rise in the former case to pain, in the latter to both pain and diminution of bulk; an enlargement in the first instance not unfrequently terminating in the reverse. The

causes, therefore, of nervous pain in the liver, appear to resolve themselves into—

1*st.*—Sympathetic irritation from error in some neighbouring structure as from abdominal irritation or dyspepsia.

2*ndly.*—Irritation from deteriorated blood as from cachexia and malaria.

3*rdly.*—Irritation from causes within the liver itself, reflected from inflammatory action, abscess, or other changes; perhaps simple excitement from heat.

4*thly.*—Irritation from direct pressure on the nerves, caused by general alteration in the minute structure of the organ.

Any of which may exist separately or combined.

Treatment.—The treatment will, of course, depend mainly on the presumed cause, and I need not even hint at the correct method of relieving the various diseases which I have brought forward as being so frequently co-existent with, or the cause of hyptalgia. It is sufficient, if I endeavour to fill the hiatus which I fancy will be allowed to exist, in the fact that neither hyptalgia or its special treatment, when occurring without any very evident cause, finds a place in any of our standard works. In these cases when neuralgic pain exists and when no functional or other errors are to be detected, I can state from experience that medicines are of little avail. Mercurials and other purgatives should be altogether eschewed. Of tonics, the best is Arsenic, which appears, as Dr. Billing observes, to exert a slightly emulgent action on the liver. Blisters will relieve the pain for a time. Iodine paint is occasionally effective. Belladonna plasters will sometimes prove beneficial; and friction with a flesh brush is to be recommended. Occupation of the mind, however, is the best remedy, either by travel or some engrossing pursuit. If, however, none of these methods of treatment give relief, a change from one station to another; from a cold to a warmer climate; from the interior to the more relaxing influence of the sea coasts; and lastly, if the patient be at home, from England to the tropics, may be recommended with every chance of removal, or at least an amelioration of the disease.

ON MASKED MALARIOUS FEVER, SPLENIC LEUCOCYTHÆMIA AND CACHEXIA LOCI.

BY ASSISTANT SURGEON W. J. MOORE, M.D., L.R.C.P., EDIN., &c.

Presented September 1861.

MALARIOUS disease has from time to time been supposed to depend on debility, or peculiar cachexia, more than on any specific poison—as marsh malaria or paludal emanations. Thus the 122nd proposition of the Brunonian system [1] of Medicine asserts: "Debility is the cause of intermittent as well as of every other form of fever." From this arose the stimulating method of treatment, which towards the end of the last century gained such an ascendancy in the profession, and which was again revived by the late Dr. Todd. [2] Although nowhere denying the existence of marsh poison, yet Dr. Todd would appear from the treatment he so strenuously recommended and practised, to assign a very secondary position to malarious influences, as regards the induction of disease; his chief reliance being placed on the curative effects of stimulants, and not on anti-periodics. Again but a very short period since, Dr. Burdel, [3] of Paris, in a paper on "Glycosuria as an accompaniment of Fever" [4] states, that he regards marsh poison "as a myth." Dr. Campbell, of Georgia, holds much the same opinion. Still more lately Dr. Knapp, [5] the President of the University of Sowa, has denied the existence of malaria as a cause of disease, by referring 'every ill which flesh is heir to,' as a result of the

1 Brown's Elementæ Medicinæ

2 Dr. Todd's Clinical Lectures on Acute Diseases.

3 L'Union Medicalé, No. 139, 1859.

4 Dr. Campbell's Report on the Nervous System in Febrile Disease.

5 Researches on Primary Pathology and origin and laws of Epidemics.

scorbutic diathesis. This author writes: "The scorbutic diathesis is primary pathology. All known causes of pestilence, as we have shown, produce their effects, by impairing the nutritive functions; and we do not admit any hypothetical causes, such as supposed malaria, epidemic influence, or occult qualities in any sense. These terms are only cloaks for our ignorance that hinder the progress of science."

While admitting the general influence, which that peculiar blood deterioration which constitutes Scurvy may exert; while acknowledging that it renders the system extremely prone to attacks of intermittent disease from the imbibition of a very small amount of malaria; and while also confessing the almost universal prevalence of the scorbutic taint in tropical climates, as is evidenced by the different ulcers and boils endemic in various localities, as at Aden, Delhi, and in Scinde; still I for one cannot recognize the scorbutic condition as the cause of every disease, that is as "primary pathology."

Neither can I suppose, as the authors quoted, and also some few others would have us do, that the generally received notions regarding malaria are "made up of nought but inconsistencies;" or that other influences have any effect in the excitation of intermittent disease. Rather do I imagine that these gentlemen 'see but what they list,' and fail to recognize in the absence of intermitting paroxysms, those conditions, the results of malaria, which I purpose very briefly describing as Masked malarious fever, and Leucocythæmia Splenica.

Although we cannot demonstrate by chemical tests the presence of miasmatous poison; although we cannot collect it as we do electricity; isolate it as oxygen, hydrogen, and other gaseous bodies; or force it to acknowledge its presence, as is the case with ozone; still peculiar circumstances being co-existent, we are morally certain that it will manifest its presence by the induction of a particular diseased action in the human subject, and indeed, as some have asserted, in the lower animals also.

Thus although "causa latet, vis est notissima"; and wherever moisture from undrained surfaces, marshy or drying ground, decaying vegetation, ravines, beds of rivers and their emboucheres, ferruginous soils, &c. co-exist with heat, there the

presence of malaria is all but demonstrated, by the well known periodical disturbance it creates in the system.

Moreover, although we cannot isolate malaria, we are nevertheless well acquainted with its characteristics and habitat. The latter indeed has been known from the earliest ages; long before Lancisi in 1695, wrote the first separate work on the subject entitled "De Noxiis paludum effluviis." With the means of prevention and removal, we have also long been acquainted. The value of drainage and general sanitary regulations cannot be questioned, and although in very many instances the utmost advantage is *not* taken of such knowledge; although frequently,

"Advice is sporting while infection breeds;"

still the very fact of such measures preventing the recurrence of malarious disease, cannot leave any reasonable doubt that a something which we call miasm does exist, and that this something manifests its presence by the induction of one or other form of a peculiar and distinct disease.

The manner in which malaria produces its effects in the human frame, is now and will probably for ever remain a complete mystery, although a number of ingenious hypotheses have been brought forward to account for it. Thus 'habit,' 'diurnal revolution,' 'periodical development of fermentable matter in the blood,' some vague 'general law of the universe,' 'oscillation of posture,' with other far-fetched theories, have been from time to time advanced in explanation of the effects of marsh malaria. The latest attempt at expounding the rationalé of the action of malaria, with which I am acquainted, is that of Mr. Hughes, [1] of Brighton, who opines that the sympathetic system is that part of the organism specially affected by the malarious poison, and that the phenomena of ague depend on a periodic excitation of it by the poison, followed by an equally immoderate reaction in the opposite direction; which latter at length settles down to the equilibrium of health. After bringing forward the rhythm of the heart and the periodical excitement of the ovaries and uterus, all, be it observed, mainly supplied with nerves from the great sympathetic; this gentleman observes: "From the

[1] Lancet, Aug. 4, 1860. On "Periodicity as a character of Disease."

marked periodicity apparent in the actions of these two organs, exclusively animated by sympathetic ganglia, we seem justified in the conclusion, that a periodical evolution of nerve force is characteristic of this division of the nervous system; and if this be the case we cannot be surprised that it should give its peculiar character to phenomena resulting from the effects of a poison on itself. Thus the periodic character of the paroxysms of ague is reduced, under the more general law of the periodic character of all phenomena, morbid or natural, over which the sympathetic system presides, dependent upon the endowment of this system itself."

This, although certainly not an *explanation* of the manner in which malaria acts, reduces periodicity as a character of disease, by fair analogous reasoning, to morbid irritation, or disorder of the vaso-motor or sympathetic nerves.

This being the case it must be evident that different degrees of irritation may exist either from larger or smaller imbibition of malaria, acting upon a sthenic or asthenic constitution. Thus some of these malarious impressions are vague and ill-defined; so much so that the true cause may probably remain long unsuspected. These are the disorders to which the term "Neurolytic" has been lately given by Dr. Handfield Jones, in his paper entitled "A Tract on neurolytic and aguish disorder, and on malarious remittent fever—Lond. 1859."

Most authorities admit that in those localities where the sources of malaria are most abundant, remittent fever will be found to exist. Where the poison is formed in a less concentrated form, intermittent disease is supposed to result. When a still smaller proportion of miasm is emitted, masked malarious fever, or one or other of the neurolytic phenomena will be induced. Thus, Mr. Day [1] states,—"Malaria may be so virulent as to kill at once, or received into the body with less intensity it may cause slighter degrees of malarious fever, or even remain latent for a long space." Watson [2] in his article on Intermittent remarks—"Sometimes there is no distinct stage at all, but the patient experiences frequent and irregular chills, is languid,

[1] Day on Tropical Fevers, In. An. Med. Science, Vol. xi. p. 87.

[2] Watson's Practice of Physic, Vol. i. p. 725.

uneasy, and depressed. This state is commonly known among the inhabitants of our fevery and aguish districts, as the dumb ague, or the dead ague. The person is said not "to shake out." Again, a late writer in the *Indian Lancet* [1] describes two kinds of fever; one carrying off its victims quickly, the other not killing but gradually wasting the body.

Although it is thus seen that the different morbid impressions, the effects of malaria, have been recognized by various observers in localities and climates widely differing, still the condition I am about to describe under the title of "Masked malarious fever" does not appear to have been fully acknowledged, as a frequently occurring deviation from health, by any of our writers on tropical diseases. Martin, Johnstone, Annesley, and even Morehead are silent on this point.

Masked malarious fever may be regarded as the manifestation of the presence of malaria in a minor degree of concentration, or acting upon a feeble or irritable constitution. It consists of febrile excitement, which may be remittent or intermittent, and can be often recognized as occurring to delicate females. The scorbutic diathesis is sometimes concomitant, and may be looked upon as a powerful predisposing cause.

The individual thus affected complains chiefly of heat, dryness, and burning in the palms of the hands, and less frequently in the soles of the feet. There is more or less general uneasiness, perhaps slight evanescent headache, but no decided pain. The circulation is not excited. The appetite is generally unaffected, but the sleep is frequently broken and restless. The burning of the palms may be persistent, with slight remissions, when the parts become slightly moist; or there may be distinct intermissions. This condition frequently prevails for months, or indeed years, and is oftentimes so little marked as scarcely to attract the attention, or at all events does not excite the fears of the individual in whom it exists. In other instances, however, it constitutes a perpetual source of annoyance and discomfort; persons so affected are especially prone to attacks of fully developed fever: but in some cases they appear to escape the

[1] Reminiscences of Lahore, September 1860.

latter, by the malarious influence expending itself in the constant induction of the masked form.

The treatment of this condition is readily deduced, and consists in attention to diet; the administration of those remedies designated by Handfield Jones "toners of the vaso-motor nerves" of which Arsenic and Quinine are the chief; and the habitual use of coffee as a beverage. The latter article has long enjoyed a questionable repute as an antiperiodic, and has been highly recommended as such by Nebelius and Baglavi, by M. Payen, Delioux and others. As an adjuvant in the masked form of malarious fever, I entertain no doubt of its efficacy. Change of climate, or at all events of locality, is however the only certain cure.

The condition I purpose describing under the title of "Splenic Leucocythæmia" is repeatedly developed as a generation, or accompaniment of masked malarious fever, and indeed it has sometimes arisen without even the latter indistinct febrile state having been previously noticed, in individuals who have resided long in malarious localities.

Leucocythæmia Splenica consists in enlargement of the spleen, *without* concomitant febrile paroxysm, and is not the same disease which occurs during the progress of, or after attacks of remittent or intermittent fever. The increase of size is due to hypertrophy of normal structure and is always associated with intense cachexia, characterized by a peculiar pallor, and by an excess of those white corpuscules in the blood first pointed out by Dr. Hughes Bennett in 1845.

During the earlier stages of cases of enlarged spleen, from fever, the condition of the organ is one of engorgement, distention, and congestion, rather than that of fibrinous deposit and hypertrophy of structure; although repetitions of the attack will surely lead to such changes. That the first is the case, appears clearly evident by the very rapid manner in which enlarged spleen disappears, not certainly as a Parisian Physician would have us believe, in a few minutes after the exhibition of Quinine, but in the course of some days, when the increase of bulk is due to fever. When, however, the constituents of the blood

become converted into tissue of low organization, or in other words, into hypertrophy of the spleen, then the enlargement is permanent, or at all events can only be removed "by the slow and gradual process of absorption."

The same occurs in the chronic disease of the liver where slow depositions occur, leading in the first instance to increase of bulk, which condition, as in the spleen, is distinct from inflammatory congestion, or engorgement.

The question now arises whether this condition of the spleen is the consequence or the origin of the cachexia and deteriorated blood co-existent. It has been supposed that portions of "splenic pulp" or previously extravasated blood, changed in their nature, and unfit for their proper purposes, might find their way into the circulation, either through the splenic vein or lymphatics. This may possibly be the case, after extravasation occurring in the cold stage of ague; but when the latter has not taken place, when the spleen becomes enlarged without this prior occurrence, we are necessitated to believe that malarious influences produce that condition of blood which favours its stagnation and deposit in certain structures; and if it be true, as stated by Gray, [1] that the weight of the spleen increases considerably, and contains more blood during the digestive process than at other periods, there is a natural congestion established, from which the contaminated and poisoned blood cannot retire without leaving some of its constituents in the shape of fibrinous deposits in that organ.

And if in addition to this safety-valve function, the spleen exerts an influence in common with the lymphatics on the assimilating process, and aids in rendering the crude materials fit to circulate in the blood, it is easily understood how diseases of this organ will react on the system. And if the white blood cells have for their office the transformation of albumen into fibrine, [2] we can also readily imagine that this process being checked in the spleen at least, the white corpuscules undisposed of may pass again into the general circulation, their excess becoming leucocythæmia splenica.

[1] Gray on Structure and Uses of the Spleen.

[2] Brit. For. Med. Ch. Review 1855.

The syphilitic and mercurial cachexia, the scorbutic diathesis, and debilitas from heat must be powerful predisposing causes of this blood disease.

Symptoms.—It is this condition where, in addition to the physical signs of enlarged spleen, the dull expression, the anæmic countenance, the lemon-coloured or transparent conjuctivæ, the pale tremulous but coated tongue, the blanched lips, the occasional existence of systolic cardiac murmur, and the tendency to hæmorrhage, evidence the deteriorated and poisoned diathesis established.

The indication of treatment is of course to combat the cachectic condition; and as we are unable to remove its cause this cannot be otherwise fulfilled than by transferring the patient from such influence, that is, by effecting a thorough change of climate. If this cannot be obtained, a sea voyage, removal to another station, district, or even house, should be suggested. Medicinal treatment consists in tonics as quinine and iron, and the tonic aperients of Twining and Shulhed. All depleting treatment as repetition of leeches over the spleen or the exhibition of purgative medicines given with a view to decrease the size of the organ, are distinctly contra-indicated. The former only increase the general cachexia and debility, and the latter in addition may, in the weakened state, excite dysentery. Mercury is also inadmissible, tending as it does to debilitating results. Blisters or other counter irritation, excepting by Iodine Paint, are also unadvisable. Warm baths and the nitro-muriatic acid formulæ are always desirable.

Cachexia Loci, although frequently associated with the masked malarious febrile condition and with splenic leucocythæmia, may, I think, be recognised as arising "per se" without any prior or concomitant febrile congestive, or inflammatory disorder whatever, and without any organic change in either of the internal organs. This condition I believe to be not so much the result of malarious influences, as of other unavoidable causes presently to be mentioned. Still, however, malarious atmosphere must predispose the system to fall into this condition of cachexia, but if imbibed to any great extent, it, as it were,

conquers all other agencies, and developing itself by its peculiar action, adds very materially to the gravity of simple cachexia loci.

Malaria may in other ways be a cause of the latter condition. The asthenic results of intermittent or remittent fever may remain long after the periodical phenomena have disappeared; and therefore long after (as it may be presumed) the force of the poison taken into the system has been expended; cachexia may be an evidence of the *previously* diseased condition. In like manner enlarged spleen, with its attendant retardation of assimilation and nutrition, may establish the foundation of a cachectic condition, which manifests itself after all evidence of splenic disease has disappeared. Again cholera with its albuminous waste; dysentery with its exhausting discharges; liver disease with its attendant stagnation and loss of vitality of blood; the debility consequent on the employment of a too antiphlogistic and energetic treatment; the cachexia of mercury when the latter becomes a "remedy of necessity;" the scorbutic taint; are all, even although the primary disease may be apparently recovered from, powerful predisposing causes of the condition I designate by the term "cachexia loci."

The direct causes however of the latter deterioration, and from which it frequently arises without the predisposition engendered by the previously cited occurrences, are, the prolonged and excessive heats; the moistures and chilling colds of the climate; the loss of appetite; the sleepless nights; the immoderate perspiration; the sudden chills during the latter; the occasional extraordinary fatigue and exposure which Military Officers are called upon to undergo; and the numberless daily petty annoyances, inevitably more or less happening to the European resident in tropical climates.

The delicate female and the naturally physically weak European male, are most liable to "cachexia loci." It does not however occur *only* to Europeans, natives of both sexes are alike frequently the subjects of this deterioration. Most medical men who practise in the tropics, must have noticed the manner in which natives of one part of the country pine and emaciate when taken to a different locality, although indeed the climate to

all appearance is much the same in both places. Numerous instances of the kind might be adduced, but it will be sufficient if I mention one. Dr. James Burnes, K. H., in his "Sketch of the Medical Topography of Bhooj," states—"I have known many persons from Bombay, servants in particular, perfectly useless from continued sickness in Kutch, who recovered their health and energies the moment they left it."

The native, the subject of "cachexia loci," manifests "Nostalgia" as a prominent symptom of his condition. The European seldom allows this to be a prominent symptom.

At first sight it would appear that the causes producing cachexia loci, which I have styled *direct*, would scarcely affect the native of the country to as great an extent as they do the European. When, however, it is recollected that the natives as a body are physically weaker than the European; that the lower classes of the former are more exposed, worse housed, and more sparely fed than any of the latter, it ceases to be a matter of surprise that natives of the country are affected by the same influences which would the more deteriorate the European, according as his mode of life approached that of the former.

I believe, however, that the scorbutic taint is generally more evident in natives, the subjects of cachexia loci, than in Europeans so affected.

The chief symptoms of this condition are a sallow, bloated, and ex-sanguine countenance; pearly conjunctivæ; impaired digestion; palpitations; tinnitus aurium; attenuation; disinclination to exertion; impaired memory; frequent nocturnal emissions; probably albuminous urine; a white, pale, tremulous tongue; aching of the limbs, particularly the lower extremities; a feeling of thorough weariness; hepatic or eczematous eruptions on different parts of the body; great irritability regarding trifles; indifference as regards the future; occasional thoughts of self-destruction; rheumatic or neuralgic pains in the abdomen, which is occasionally tumid or tympanitic; enlargement of glands; eruptions of boils; and eventually a disposition to passive hæmorrhagic discharges. As Shakespeare, who was almost as great a physcian as poet, observes—

"The corrupted blood some watery token shows."

Albuminous urine has been stated to be a probable symptom, or accompaniment of cachexia loci; and this, I believe, arises without any organic kidney disease. It would appear to depend on simple exudation from extreme tenuity of blood, combined with loss of tone in the secreting apparatus of the kidney.

For cachexia loci medicines are but of little avail. Tonics as quinine and iron are of course indicated, with generous diet and liberal allowance of malt liquor. The only means of cure, however, is a thorough change of climate, and even after this is effected, it will be months, and may be years before the patient recovers his former vigour. It is in these cases that pure mountain air proves so beneficial and enables the convalescing tourist on the Scottish or Welsh Hills, to "throw physic to the dogs," and acquire a Spartan state of health. If an individual in this anæmic condition remains long exposed to the influence of the climate, which has induced his deteriorated state, a gradual enlargement of the liver and spleen will probably arise; intermittent fever recur; and perhaps the insiduous form of suppuration in the former organ take place.

In conclusion, I may be permitted to remark that the three conditions I have attempted so briefly to describe, appear to me to demand a place in our Nosological arrangements of disease.

ANNUAL REPORT OF THE 1st BATTALION 4th (THE KING'S OWN) REGIMENT, STATIONED AT AHMEDABAD IN GUJARAT, FOR 1860.

BY SURGEON J. GORRINGE, M.D.

Presented August 1861.

Section I.

Meteorology.—The climate of the midland division of Gujarat, of which Ahmedabad is the chief town, is not unfavorable to European constitutions with certain precautionary measures. The months of April, May, and June are intensely hot, and indeed sometimes as early as the 20th of March the hot winds blow, when the thermometer in a house frequently reaches to 94° and in a tent to 105°, and all exposure to the sun should be avoided as certain to produce fever, if not insolation. Then follows the monsoon in July and August, and the abundant vegetation thereby gives rise to much fever in the autumn. After the 20th of October the mornings and evenings are felt refreshingly cool.

It will be seen by a reference to the Return which accompanies this Report, that there were 36 days on which rain fell, amounting to between 27 and 28 inches during the year.

In the midland the average temperature throughout the year is greater than in the northern and southern districts of the province. Here we want the open sea to temper the air as it does in the south, while the richer soil and more numerous inclosures tend to render the nights hotter than is the case in the north. The station has been very free from Bowel and Liver complaints and from Rheumatic affections, the only disease which prevails is Intermittent Fever.

Physical Geography and Medical Topography of the surrounding Country.—The province of Gujarat, which forms the Northern Grand Division of the Bombay Territory, is bounded on the N. W. by the Buness River, which, arising in north-western Marwar, holds a S. W. course, passing by Deesa, and receiving but few tributary streams, until it loses itself in the Runn. From the mouth of this river, a line drawn along the edge of the Runn leads us through the western part of the Keerungaum pergunnah, and intersecting the small neck of low-lying country which here bounds Kattywar, brings us to the mouth of the Saubermuttee at the head of the Gulf of Cambay. We have now this Gulf, and afterwards the Indian Ocean as far as Damon, for the western boundary. A line drawn from Damon to Durrumpore gives us the southern. The eastern and north-eastern are formed by a succession of hilly ranges stretching (with interruptions of three great alluvial valleys) along the whole of this side of Gujarat, until they are lost in the hills of the Aboo range.

For convenience of description Gujarat may be arranged in three divisions, viz., a Southern, Midland, and Northern, each of which present peculiarities; but my remarks must be limited to the midland, in which division the Regiment has been stationed. The capital is Ahmedabad, built on the banks of the Sauburmuttee, a broad and generally rather rapid-flowing river, which arises from the hills of Mewar and the Deybur Lake, and being joined by the Hautmuttee high up in its course and afterwards by four smaller rivers (the Karee, Meshwa, Watruck, and Dadur), falls into the sea at the head of the Gulf of Cambay; so that this portion of Gujarat may be supposed to abound in water as is actually the case. Ahmedabad was formerly a splendid capital, and is still important as being the Head Quarters of the Northern Division of the Bombay Army and of the Northern Zillah in the Civil Establishment, and hardly less so as the place of residence for numerous merchants and bankers who carry on here an extensive trade. It is celebrated too for the excellent quality and durability of its cotton, silk, and brocade manufactures. Its population is about 100,000.

Soils.—The soil is a deep brown, sometimes with a greyish tinge, very favorable for the growth of all sorts of produce. Black soil exists in the lower levels, but the brown and greyish or "Gorat," as it is called, greatly predominate.

Vegetable Productions.—Sugar-cane in all the lower parts of the Ahmedabad district is much grown and of a very fine quality. Wheat, jowaree or Holcus sorghum, is the usual relieving crops for the cotton soil. Barley, bajree or Holcus spicatus, forms the staple food of the natives and their cattle in this district. Castor oil plant, tobacco (Nicotiana Tabacum), Curcuma longa or turmeric, poppy (Papaver somniferum), cussumba (Carthamus tinctorius), kodra (Paspalum scrobiculatum), gram (Cicer arietinum), plantains, and melons, form extensive articles of produce in the sandy rivers.

Trees.—The whole of this division is well wooded; the variety of trees give a pleasing diversity of feature to the fields. Most of the fields around Ahmedabad are skirted with tamarind, mango, banian, peepul, and Ficus racemosa. The hedgerows are thick and luxuriant, composed of euphorbias, and asclepiads of various species. The Anacardium orientale nut or "marking nut" is common. The Acacia arabica, and Cassia auriculata. The custard-apple or Anona squamosa. The bright-red Butea frondosa too is very common.

Food.—Two-thirds of natives use vegetable diet. Pulse of all sorts is in common use. *Liquors*—toddy from date tree; opium is the chief stimulus, or bhang: the lower class smoke the dried flower—it is then called "Ganja."

Diseases of Population.—Ahmedabad had formerly a reputation for salubrity, but the experience of later years does not seem to have borne this out; nor is this surprising, as all half-ruined towns in a rich country become so many nests of malaria, and I can easily imagine that this city in its former state of completeness and grandeur, well supplied with pure aqueduct water, and having no ruins in its interior, and possessing as it does great facilities for drainage, natural and artificial, may have been exempt from the invasion of autumnal malarious fever, to a degree at present quite unknown in Gujarat; as it is, the population is decimated every year by cholera and fever.

The levelling and removal of ruins; the widenings of streets; the supply of pure water; a scientific system of drainage and sewerage; the planting of belts of trees in eligible situations, must be done before any healthy change can be looked for.

Barracks, &c.—The Cantonment of Ahmedabad is about three miles N. E. from the city and occupied at present by the Head Quarters of one European Infantry Regiment, two Native Infantry Regiments, one Battery of European Artillery, and one of Native Artillery.

The Barracks of the 4th (King's Own) Regiment are built upon a slightly elevated plateau adjoining that used as a station race-course, and consists of ten rows of huts facing the S. W., their walls composed of mud, foundation of brick, and roofs of chuppur: each row is built for 50 men, and in it there is just room, when the cots are placed transversely, to allow a man to walk down its length: the walls are 1½ feet thick, the rooms 10 feet wide, 11 feet high, and 210 feet long. There is a verandah in front of 6 feet in width; the rear wall of each hut is pierced with 20 windows, each protected by matting; and the front with 30 doors 7 feet high. The monthly average number of men in each hut during the past year was 44, and which gives the average monthly cubic feet per man 528. The huts have stood very well for three monsoons after repair, but they have a mean appearance and are unprovided with tatties or such comforts as troops might reasonably expect in this climate, though last year punkahs were put up.

The Barrack accommodation for married Soldiers consists of several rows of mud huts, each row divided into 12 compartments, and these again subdivided so as to give two rooms to each family.

The ventilation of the men's rooms, also of the several guard-rooms, &c., has been sufficient to preserve the purity of the air, and no occasion has required any particular representation on account of defects arising from such causes. The climate is not sufficiently cold in winter to require the rooms to be warmed by artificial means other than the closing of some of the doors and windows at night. Each hut is provided with four roof

openings for the exit of heated air at all times, and which cannot be closed, but so arranged that during the monsoon, rain is not admitted. The walls have been twice white-washed during the year; the ceilings, consisting of bamboo matting, have not undergone this process.

The ablution and bath rooms consist of small mud huts, containing benches for water chatties and large wooden tubs in the centre of the floor, and which are regularly used by the men. Besides which, during the summer, a weekly bathing parade under a Medical Officer and the Orderly Officer is ordered to the river Saubermuttee.

The cooking of the men's rations has not been so varied as could be desired, in consequence of the absence of ovens; but these have been sanctioned on my recommendation. The Latrines, Urinals, &c. are daily cleansed by the conservancy establishment under the Quarter Master, and liberally supplied with lime daily, and twice a week charcoal and salt burnt in them for purposes of deodorization. The foul water from the cook-houses and the bath rooms runs into cesspools which are daily emptied by Puckauly Bheesties: no nuisances have existed from any of these causes.

Water is supplied to the troops from deep wells in the Camp and drawn up by Government bullocks; its amount is abundant and its quality excellent, and it does not require filtering.

Diet, &c.—The daily ration consists of 1 lb. Bread, 1 lb. Beef, 1 lb. Vegetables, 4 oz. Rice, $2\frac{1}{2}$ oz. Sugar, $\frac{5}{7}$ oz. Tea, 1 oz. Salt; Mutton twice and Beef five times a week. The vegetables are sufficient, and the rations are cooked generally according to the men's fancy, but chiefly curries and boiled meats are used, there being no ovens or dishes for baking.

The diet of the troops is as good and varied as could under the circumstances be expected, but the recommendation which I made about ovens has not yet been carried out by the Engineers, though sanctioned by the Major General, and I have made a further representation on the subject, which has caused an enquiry.

Good Porter and Arrack furnished by the Commissariat is sold at the regimental canteen at moderate prices; and Coffee, Tea, Soda Water, Lemonade and Ginger Beer, can be obtained at the Regimental Reading Room.

Very few diseases could be directly traced to intemperance.

Clothing, &c.—In winter the dress consists of cloth tunics, cloth trowsers, and forage caps without covers. In summer the "khakee" and wicker helmet. In spring and autumn the serge tunics and dungaree trowsers or white trowsers. These changes appear to be well adapted to the climate, and I have not found it necessary to make any recommendations relative thereto.

There have not been any lengthened marches during the past year, and only two cases of foot soreness from defective boots came under my observation, and which were remedied by my ordering new boots.

The bedding has been clean and wholesome, and properly aired in accordance with the Regulations.

Duty and Exercise.—The usual amount of garrison duty has been performed, the nights in bed were as follows, viz:—Serjeants 5, Corporals 4, Drummers 9, and Privates 5½. An hour's drill morning and evening at such hours as did not expose the men to the heat of the sun, viz., in summer at 5 A.M. and 5½ P.M., and in winter at 6 A.M., and 5 P.M., varying with the changes of the season.

Skittles, foot ball, quoits, cricket, puff and dart, and theatricles have been the pastimes indulged in by the troops at this station, together with a good regimental library, reading room, and canteen. The above appears to have been duly appreciated, and have no doubt tended to maintain the general health of the regiment.

Canteen.—The canteen is a small mud hut and therefore not so comfortable as it might be; its ventilation and cleanliness have been duly attended to: porter and arrack are almost the only articles sold at the "canteen proper" and which are supplied by the Government Commissariat, a board of Officers having previously decided on their qualities.

Crime and Punishment.—There are six garrison cells built according to the latest regulations as to form, size, and cubic space, and a small guard room attached; they are however badly placed in two rows, so that one row is nearly always without the advantage of wind. They require an ablution room for use in common. The lock-up room belonging to the Quarter Guard will hold about four prisoners; it is built of mud and chupper and badly designed. All these buildings have been kept clean and properly ventilated.

Hospital.—Date of construction unknown; total number of wards 8; total number of beds 54; average number of sick in wards 30 (Head Quarters Hospital); number of cubic feet per patient, 1461.

The ventilation of the Hospital has been as good as the circumstances of the building could admit of, but being built for a private residence, it consists of a number of small rooms, dark and badly provided with windows. Punkahs and kuskus tatties were freely used during the hot weather, but it is so built about that it is very unfitted as a building for sick men. There has been no over-crowding of its wards.

A new privy has been lately erected at the Hospital which is commodious and well ventilated; it requires a covered way. A cesspool for the urinal is emptied daily by a packaul bheestie and the solid excreta removed by the conservancy establishment of the Barrack Department. A large well in the Hospital compound supplies good and sufficient water and is drawn by the bheesties of the establishment. There is a good bath and ablution room connected with the Hospital; and a capacious kitchen and two cooks provided with the necessary means have proved satisfactory. The wards have been lime-washed inside quarterly, and outside once a year.

No form of zymotic diseases has broken out or spread in Hospital. Vaccination has been regularly performed with all the new-born children (12 in number), and every man, woman, and child now presents either marks of small pox or of vaccination, according to the table in the return.

General Summary.

Average strength of the Regiment including all Detachments	918
Admissions to Hospital	2406
Discharged thence to duty	2320
Died in Regimental and Detachment Hospitals	49
Ditto ditto elsewhere	6
Remaining in Regimental and Detachment Hospitals	70
Daily average sick in all Hospitals	66
The per centage of deaths to treated	2·00
Ditto sick to strength	265·68
Ditto deaths to strength	5·33

The proportion which admissions and deaths from zymotic diseases have borne to the admissions and deaths from all causes were as about 3 to 1.

Causes of Mortality, arranged under the orders of each class.

Zymotic	Miasmatic	40	Local	Kidney	0
	Enthetic	0		Gennetic	0
	Dietic	0		Bone & Muscle.	0
	Parasitic	0		Skin	0
Constitutional.	Diathetic	0	Developmental	Nutrition	0
	Tubercular	1			
Local	Brain	3	Violence	Accidents	4
	Heart	2		Battle	0
	Lung	1		Homicide	0
	Bowel	4		Suicide	0
				Execution	0

Table showing the increase and decrease of the Regiment from 1st January to 31st December 1860.

	Strength, including Serjeants, Drummers, Rank and File, on 1st January 1860		767
Increase.	1. Joined from England	343	
	2. Enlisted abroad	0	
	3. Transfers received	3	
	4. Deserters rejoined	0	
	Add total Increase		346
	Total Strength		1,113
Decrease.	5. Deaths	55	
	6. Sent to England { Time-expired 31 / Invalided ... 22 }	53	
	7. Discharged by Purchase	6	
	8. Do. by limited Service expired, Transfers, &c.	61	
	9. Desertion	0	
	Deduct total Decrease		175
	Strength, 31st December 1860..		938

Present Composition of the Corps.

	Serjeants	Corporals.	Drummers.	Privates.	Total.
Under 18 years of age.	0	0	4	2	6
From 18 to 19 ...	0	0	5	102	107
„ 19 to 20	0	0	4	94	98
„ 20 to 25	11	15	5	303	334
„ 25 to 30	8	17	1	147	173
„ 30 to 35	12	7	2	65	86
„ 35 to 40	14	4	0	42	60
„ 40 to 50	7	0	0	5	12
En-route to join	1	2	0	59	62
Total..	53	45	21	819	938

No. of each Country.

	Officers.	Serjeants.	Drummers.	Corporals.	Privates.	Total, exclusive of Officers.
English	21	32	14	24	450	520
Scotch	3	2	2	1	50	55
Irish	17	18	5	18	260	301
Foreigners	0	0	0	0	0	0
En-route to join	0	1	0	2	59	62
Total..	41	53	21	45	819	938

Length of Service of the Non-Commissioned Officers, Drummers, and Privates.

	Serjeants	Drummers.	Corporals.	Privates.	Total.
Upwards of 21 years.	3	0	1	4	8
From 19 to 21 ...	5	0	0	4	9
„ 15 to 19	12	2	5	30	49
„ 10 to 15	13	4	17	42	76
„ 5 to 10	19	6	16	335	376
Under 5 years	0	9	4	345	358
En-route to join	1	0	2	59	62
Total..	53	21	45	819	938

Period of Residence in India.

Period.	Strength of each Class.	Admissions of each Class from 1st January to 31st December 1860.	Deaths of each Class from 1st January to 31st December 1860.
Under 1 year	287	1,300	40
From 1 to 2 years ..	390	860	11
„ 2 to 3 „ ..	261	246	4

SECTION II.

Disease.—At the close of the year 1859 there remained 33 patients in Hospital. During the past 12 months 2,406 were admitted, making a total of 2,439 who have been under treatment. Of these, 2,320 have been discharged, 70 remain in Hospital, and 55 died, being a percentage of 2·26 on the whole number.

The annexed return of the diseases which have been under treatment shows at a glance the leading particulars connected with the classes and number of such diseases, and the result of treatment.

During the year 1859 the number of admissions was 1,703, and the percentage of deaths 1·3. During the year under review the admissions were 2,406 and the percentage of deaths 2·26 (but the former was only a nine-month's return).

During January, the 1st month of the year, the admissions amounted to 123, chiefly from slight cases of intermittent fever. There were 3 admissions for pneumonia, 1 at Head Quarters, and 1 at each of the out-stations, all did well. Dysentery presented in 5 cases, viz. 3 at Head Quarters and 2 at Baroda; the treatment was satisfactory. There was 1 death at Head Quarters from acute hepatitis in an old soldier, complicated with delirium tremens and pleuritic effusion.

In February the admissions were nearly the same. On the 14th the Right Wing left for Aden, and on the 22nd a large draft of recruits, lately arrived from England, left Bombay to join Head Quarters; on their way up, one man died of apoplexy and another was drowned. One of this draft also died at Bombay from chronic dysentery. There was no death at Head Quarters, Surat, or Baroda.

In March the admissions rose to 181, and there was an increase of bowel complaints, chiefly at Head Quarters, but not great; there was a good deal of venereal this month at Aden. One death occurred at Baroda from pneumonia and one man died suddenly in Bombay harbour from a rupture of an aneurism of the aorta.

In April the prevailing diseases everywhere were fevers, and the admissions for this complaint amounted to 70, out of a total of 170. One was fatal at Aden after 22 days. *Cholera* prevailed extensively throughout Gujarat, and was very fatal in the regiments at this station and amongst the native population. There were 3 cases at Head Quarters, one of which proved fatal, and at Surat also a fatal case. There was also a death from dysentery at Head Quarters this month.

In May the average sick was at Head Quarters 27, Aden 26, Surat 3, and Bombay 3=59; which is less by 6 than last month. The total cases being also less by 31. The prevailing diseases as usual were fevers, from which however no death occurred.

There were 3 deaths at Head Quarters from cholera, out of 4 attacked, but considering the prevalence of the disease at the station with the native troops and population, among whom hundreds have died, the regiment has well escaped with only 4 cases.

Two children died this month, 1 from hydrocephalus, and 1 from diarrhœa.

On the 30th a Field Force of 300 men left for Godra in pursuit of Rebels.

In June the Field Force returned on 16th with a loss of 14 men, after being out only 18 days. A return march was commenced on the 9th day, about 55 miles from Ahmedabad; the number of days on which the troops actually marched was 15, and the average length of each day's march was 8-10 miles; yet so totally exhausted were the men that their return had to be deferred until all the available sick carriage in Ahmedabad could be sent out to assist them. The deaths were chiefly from sun-stroke and cholera. Add to which 1 case of cholera and 2 of remittent fever on their return, and soon after admission to Head Quarters Hospital. The great majority of the fatal cases of sun-stroke occurred on the 8th of June, after and during the march from Somnapore to Tasra, and in almost every case the men were attacked in the ranks on the march, or while pitching

their tents immediately after arrival; the Thermometer this day, in an Officer's tent provided with tatties (and which Soldiers' were not) was 105°. There can be no doubt that the mortality was due to the excessive heat from which the men became asphyxiated, and that the detachment consisting of (chiefly) young soldiers, scarcely 6 months in India, afforded but little power of resistance to the effects of so deadly an enemy. The treatment adopted by Assistant Surgeon Kearney, who was in medical charge, together with some recommendatory suggestions from me, will be found in a special report made to the Director General at the time.

Of the deaths at Head Quarters during this month (as stated above), three came in with the detachment and did not long survive; the other four were, one case of hepatic abscess, and three of heat apoplexy, of which two occurred in Hospital and one in the Barrack room. All being in a passive state at the time and not previously exposed to the sun; they all occurred late in the afternoon, which is always the hottest time of the day in-doors.

At Aden, the Right Wing till June had recorded but one death, and now there have been six additional; one from sun-stroke, one from an injury (the 6th cervical vertebra being extensively fractured and pressing on the cord, and displacement forwards of 5th cervical and others above it, fracture of sternum between 2nd and 3rd ribs, effusion of blood into cellular tissue of anterior mediastinum): also four deaths from fever, making a total of 27 for the whole regiment.

In July the health of the regiment much improved, owing no doubt to its being the first month of the monsoon, and there was a decrease of 112 in the admissions and only one death, and that from cholera. The prevailing diseases were still fevers, but there were 68 less under treatment, and their type was milder.

In August the decrease noticed in the previous month still obtained. The wing at Aden only had 29 in Hospital on the last day of this month, of which only 6 were fevers, showing a

marked change from July when they had 44, and in June 67; this improvement in the health of the men (writes the Assistant Surgeon in charge) is to be attributed to the change in the weather; there was generally a cool wind blowing the greater part of the day, and the nights also were cool; 4 deaths at Head Quarters this month, viz. fever, complicated with congestive pneumonia, diarrhœa in a recruit, and two from cholera, this disease being still prevalent in the surrounding districts (four cases of cholera were admitted) four children also died this month, two from cholera and two from diarrhœa.

In September the monsoon was over and the weather again became sultry and oppressive, and there was more sickness this month, chiefly in fevers and bowel complaints. The cases also were of a more severe type. There were three deaths, viz., abscess of liver in which pus formed on the 25th day and death in 51 days in a temperate man only seven months in India, and 2 from fever; a child died at Aden from diarrhœa.

In October there was some improvement, and the average daily sick was 19 less; there were two deaths at Head Quarters, one from dysentery in a young soldier soon after arrival in India and ending in perforation of the colon, the other case was from abscess of the liver in a man who had been in the country since February 1858; a child also died at Aden four days after its birth from inanition.

In November the weather became cold, particularly night and morning, and the regiment became more healthy accordingly; there was a decrease of 35 in the admissions for fever, which however were still the prevalent complaints: no deaths this month anywhere.

In December the cold weather continued and there were no deaths, and the admissions to Hospital were only 178; being 17 less than in November and 8 less than the same month of last year.

The greatest number of admissions in any one month was 355 in June, and the smallest number 123 in January.

Return of Deaths and the Stations at which they occurred.

Stations.	Feb. C. C.	Feb. Intermittens.	Feb. Remittens.	Insolatio.	Cholera.	Dysenteria.	Diarrhœa.	Apoplexia.	Epilepsia.	Hepatitis.	Phth. Pul.	Morb. Cord.	Aneurism Aorta.	Pneumonia.	Fract. Vertebra.	Found Dead.	Drowned.	Total.
Ahmedabad	..	2	4	3	8	2	1	..	..	4	1	..	..	..	..	..	..	25
Aden	5	..	..	1	..	..	..	..	..	..	..	..	..	..	1	..	..	7
Surat	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	2
Bombay	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	..	2
Field Force	..	..	..	7	3	..	1	1	1	..	..	..	..	..	..	1	..	14
Baroda	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1
Gogo	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	1	2
At Sea	..	..	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	2
Total	5	2	5	11	12	3	2	2	1	4	1	1	1	1	1	1	2	55

I will now proceed to offer such remarks on the more important and prevalent diseases and any specialities in the types of disease, as may be seen necessary for giving a distinct outline of the medical history of the regiment during the year.

Zymotic Diseases.—Diseases belonging to the Zymotic class, being the chief causes of loss of efficiency in an Army, we find accordingly in the present return, that the proportion which admissions and deaths from these diseases bore to the total admissions and from all causes during the year was about three to one.

Fevers resulting from miasma are commonly the causes of sickness during the months of June, July, August, September, and October, but prevail more or less at all seasons; thus out of a total number of 2,406 admissions, 1,226 were of this nature, and which may be classified into the following types with their respective proportions:—intermittent 1,041, remittent 22, continued 149, ephemeral 14; and the deaths from fever were 11 in number, viz. 2 from intermittent, 4 from remittent, and 5 from continued; those from intermittent and remittent being at Ahmedabad, and the continued fever at Aden.

Return of Cases of Fever in the 1st *Battalion* 4th (*King's Own*) *Regiment, from* 1st *January to* 31st *December* 1860.

	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Total treated.	Total died.	Ratio of Deaths to Strength.
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.			
Ahmedabad	41	..	22	..	12	1	22	..	18	..	55	2	62	..	70	1	86	2	80	..	48	..	33	..			
Aden	..	..	..	..	18	..	20	1	25	..	123	4	70	..	56	..	37	..	24	..	17	..	12	..			
Surat	11	..	13	..	18	..	12	..	7	..	9	..	9	..	8	..	16	..	30	..	33	..	22	..	1226	11	1 in 83½
Baroda	10	..	19	..	21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			
Bombay and Depôt	1	..	1	..	1	..	1	..	1	..	1	..	..	..	..	..	..	..	2	..	3	..	5	..			
Field Force	..	..	..	..	..	..	..	..	..	..	21	..	..	..	..	..	..	..	..	..	..	..	..	..			

Intermittent fever as generally met with exhibits its first symptoms of attack at any hour, and at any season of the year, showing however a preference to the very hot weather (to those who expose themselves out of doors at this time) and that which immediately precedes and follows the monsoon, when the sky is overcast and a sultry stillness obtains. The order of attack is generally a slight headache and a sick feeling at the stomach, and a chilly sensation and general languor amounting sometimes to a pain in the small of the back; 2ndly, heat of skin, fullness of head, quick pulse, parched lips, and thirst; and lastly, profuse perspiration. The time which each of these stages occupies being dependent on the severity of the attack and the nature of the remedies employed, but generally eight hours may be put down as the average duration of the whole; the patient may then escape without another attack for some time, or it may return the following day or in two days; but the most frequent type is the quotidian.

Only a small proportion of the cases under observation during the year were of the continued and remittent type, but these were always attended with more or less danger.

The *Treatment* adopted in ordinary cases of intermittent fever was by an aromatic stimulating draught if seen in the cold or shivering stage, a diaphoretic in the second, and quinine in the third stage; the latter being continued during convalescence for a few days. In continued and remittent fevers the treatment necessary was more complicated, and I have found leeches to the temples of the greatest benefit in those splitting headaches which usually accompany them, as well as a blister to the nape of the neck and the use of James' powder and nitre as a diaphoretic; or, if any internal congestion, calomel and James' powder; and when diarrhœa was present, calomel, pulv. jacobi, and opium combined. Quinine to be resorted to on the least indication of a remission or subsidence of the active symptoms.

The fatal cases of fever with their *post-mortem* appearances were briefly as follows:—

CASE 1.—Private Richard Roosebridge, ætat 20; a case of intermittent fever, in a very debilitated subject, and early complicated with congestion of

lungs, and on the 44th day severe cerebral symptoms supervenep and death three days after. *Treatment* by quinine, blister to chest, expectorants; afterwards blister to head, wine, and soup.

SECTIO CADAVERIS HORA V. POST MORTEM. *External appearances.*—Body much emaciated and marks of vesication at the nape of the neck. *Cranium.*—Vessels of the dura-mater and sinuses contained but little blood. There was a large quantity of serous effusion beneath the arachnoid filling up the spaces between the convolutions; the vessels of the pia-mater were not prominent, and the substance of the brain was pale and exhibited an absence of puncta-vasculosa. The lateral ventricles were filled with the same serous effusion. *Thorax.*—The lower lobes of each lung posteriorly were engorged, but the other parts quite healthy. *Heart* was natural in size and appearance. *Abdomen.*—Spleen about twice its natural size, and not lobulated; it was gorged with grumous blood and easily broken up; other viscera healthy.

CASE 2.—Private William Jacklin, ætat 19; an English Labourer; one year's service and five months on station. A case of intermittent fever, complicated with congestive pneumonia on the 14th day, and from which death ensued nine days after. *Treatment* by diaphoreties, quinine, blisters to chest, expectorants, ammonia, wine, and beef tea.

SECTIO CADAVERIS HORA VI. POST MORTEM. *External appearances.*—Body rigid, and unnaturally warm. Marks of blistering over chest, front, and back. *Head.*—The brain had a pale exsanguineous appearance, and there was much serous effusion beneath the arachnoid, filling up the spaces between the convolutions; there was no congestion of its vessels and but few red dots on section of its substance. A round hole—the size of a bullet—was found in the frontal bone, just above the growth of the hair over the right side of head, the skin had grown over it, but no attempt at reproduction of bone,—internally the dura-mater protected the brain: there was nothing observable in the brain itself, nor any history connected with it. *Chest.*—Both *lungs* adherent anteriorly by firm and old bands to the walls of the chest, otherwise they had in front a natural appearance; but posteriorly they were perfectly impervious to air and had a fleshy section, and were filled with bloody serum. *Heart* natural. *Abdomen.*—Liver large and pale, as were the kidneys; spleen firm and natural. All other organs healthy.

CASE 3.—Corporal Robert Hardy, ætat 26; an English Butcher; of two years and 10 months' service and 1 year and 3 months on station. A case of remittent fever, contracted on field service after rebels in the month of June, by exposure to sun and fatigue. Sudden death by coma. *Treatment* by James' powder and nitre and quinine, blisters to nape of neck, cold douche, enemata.

SECTIO CADAVERIS HORA XIII. POST MORTEM, BY ASSISTANT SURGEON KEARNEY. *External appearances.*—Body darkly discolored by the gravitation of blood. *Head.*—About 8 oz. of blood escaped on opening the cavity of the cranium; slight serous effusion beneath arachnoid, and in some

places this membrane had a pearly look. Brain itself was soft, and there was too much serum in its lateral ventricles; no other marked appearance.

CASE 4.—Private George Grimes, ætat 23; an English Labourer; of one year's service and five months on station. A case of remittent fever. Death on 6th day; much previous exhaustion and exposure on field service. *Treatment* by calomel, pulv. jacobi, and opium, quinine, blister to head, cold lotions, &c.

SECTIO CADAVERIS HORA VI. POST MORTEM. *External appearances.*—Body stout and rigid. *Head.*—About 8 oz. of bright-colored blood escaped on the removal of the brain; the small vessels of the pia-mater were much injected, giving the whole surface of the brain a bloody appearance; there was slight serous effusion beneath the arachnoid near the glandulæ pacchionæ, where the membrane had a pearly appearance; the substance of the brain on section presented nothing particularly abnormal, neither did its ventricles contain much fluid. *Chest.*—The pericardium contained about 3 oz. of a straw-colored fluid. The heart appeared healthy. The lungs were both gorged posteriorly with blood and serum, but anteriorly they looked healthy and crepitant. *Abdomen.*—Liver large and contained a greater proportion of white substance than natural in its composition, giving the whole interior a pale appearance on section. The spleen was enormously enlarged, weighing 20 oz., of a slate-blue color externally, but engorged internally with black blood. The *kidneys* were both enlarged and presented (like the liver) a preponderance of fatty deposit.

CASE 5.—Private George Bidnell, ætat 22; an English Groom; two and a half years' service and one year on station. A case of remittent fever, with death on the 13th day, attended with extreme debility and low muttering delirium. *Treatment* by diaphoretics, quinine, ammonia, æther, chicken soup, wine, blisters, and stimulant enemata.

SECTIO CADAVERIS HORA XIV. POST MORTEM. *External appearances.*—Body not much reduced. At present cold and rigid; marks of blister on the scalp and neck. *Head.*—The sinuses of the head and vessels of the pia-mater distended with dark venous blood; granular lymph exudations at the free edge of the hemispheres; serous effusions (about 3iss) at the base; numerous red points on section of the brain substance; choroid plexus injected with blood, serous effusion into the lateral ventricles. No other morbid change. *Chest.*—Adhesions of the lungs on both sides, anteriorly and posteriorly. They both were congested. The organs otherwise healthy. *Heart* and appendages normal. *Abdomen.*—Liver enlarged, bled freely on incision; gall bladder full; stomach and intestines distended but healthy throughout; *spleen* enlarged, very friable; kidneys natural.

CASE 6.—Private Thomas Hunt, ætat 19; an English Labourer; one and a half years' service and seven months on station A case of fever with one slight remission: death in 6 days. *Treatment* by diaphoretics, quinine, and blisters.

SECTIO CADVERIS HORA VI. POST MORTEM. *External appearances.*—Body not much emaciated; marks of blisters on head and shoulder; cadaveric rigidity present. *Head.*—The vessels of the pia-mater and sinuses of the brain gorged with blood; about 3iss of serous effusion at the base; numerous red points in cutting through the brain substance. Its lateral ventricles contained an ounce of clear serous fluid; choroid plexus distended with blood. The brain substance of natural consistence, but the medulla oblongata felt to be unnaturally hard. *Chest.*—The lungs were adherent to the chest on the right side, both healthy and crepitating. The pericardium contained the usual amount of fluid. The heart looked a little larger than natural; on its anterior surface was an oval patch of organized lymph, not separable from the muscular tissue; the walls of the left ventricle thicker (owing to cadaveric rigidity), the mitral valve somewhat opaque; other valves healthy. *Abdomen.*—Liver congested; gall bladder full; stomach and intestines healthy; spleen natural. The left kidney larger than the right, flabby and congested, otherwise healthy.

CASE 7.—Private John Glover, ætat 27; an English Blacksmith; of five years' service, 14 months in India, and at Aden since 5th March 1860. When at Baroda he had intermittent fever several times. He was admitted on the 14th March with the usual symptoms of continued fever. There were in his case occasional intermissions at uncertain intervals. He gradually sank and died on the 2nd April. *Treatment.*—Cold application to head, salines, calomel and James' powder, quinine in the intermissions, blister to back of head, chicken broth, jelly, sago, and wine.

POST-MORTEM APPEARANCES FOUR HOURS AFTER DEATH. *Head.*—There was a considerable amount of venous congestion and effusion beneath the arachnoid; no perceptible change in the substance of the brain. *Thorax.*—Heart of natural size, wall of right ventricle very thin and pale; valves healthy; lungs both healthy, about four ounces of serum effused into right pleura. *Abdomen.*—Liver much enlarged, soft and pale; its substance not easily torn. The gall bladder almost empty. Kidneys rather large but healthy. Intestines healthy. Pancreas hard and difficult to cut, and of a darker colour than usual.

CASE 8.—Private Benjamin Reynolds, ætat 28; an English Agricultural Labourer; of 7 years and 11 months' service, 2 years and 8 months in India, and at Aden since 5th March 1860, since which date his health had been very indifferent. He was admitted at 2-30 P.M. on the 12th June with the ordinary symptoms of "continued fever," and soon afterwards became delirious. Leeches were applied to the head and he became much better, and was free from delirium next morning. About midday on the 13th when it became hot and sultry he became much worse, delirium returned, with hot and dry skin, and soon afterwards he became insensible and died at 3-45 P.M. *Treatment.*—Purgatives on admission, cold application to head, leeches to head on two occasions, salines, blister to neck and sinapisms to legs, stimulants.

POST-MORTEM APPEARANCES 15 HOURS AFTER DEATH. *Head.*—Veins congested, and some effusion of serum beneath the arachnoid; bloody spots on cutting brain substance, more numerous and larger than usual. About 3i of pale serum in the lateral ventricles. Veins of choroid plexus not congested. *Thorax.*—There was fatty degeneration of the heart, especially of the right ventricle, the muscles structure of which was exceedingly thin; valves quite healthy. *Abdomen.*—Liver enlarged and pale; gall bladder full of bile. Both kidneys larger than usual and pale, and probably diseased. Intestines healthy; spleen rather enlarged and somewhat soft.

CASE 9.—Private Edward Mason, ætat 28; an English Mason; of 5 years and 6 months' service, in India 1 year and 5 months, and at Aden since 5th March 1860. Had fever several times since he came to Aden. He was admitted on the morning of the 10th June, and stated that he had not felt quite well for several days. He had headache, hot skin, quick pulse, thirst and other symptoms of "continued fever." There was very slight improvement afterwards, and he suddenly became worse about noon on the 14th and insensible, and died at 3-45 P.M. Before death the abdomen was very hot and dry, and there was a dark expression of face; pupils rather contracted. *Treatment.*—Salines, calomel, and James' powder, cold applications and leeches to head, purgatives on admission and occasionally afterwards, cupping to neck, spoon diet, beef tea.

POST-MORTEM APPEARANCES 14 HOURS AFTER DEATH. *Head.*—The veins not much congested, but a very considerable amount of serum was effused beneath the arachnoid; not much increase in size of the bloody spots on cutting substance of brain; lateral ventricles contained about 3ij of bloody looking serum; vessels of choroid plexus not congested. *Thorax.*—Heart flabby with very little fat on it, and its lining membranes of a dark pink color from post-mortem changes. Both lungs more congested than usual, but in other respects healthy. *Abdomen.*—Liver of natural size and consistence, and presenting no appearance of disease; gall bladder pale; spleen twice the natural size, and softer than usual. Both kidneys healthy; intestines healthy.

CASE 10.—Private John Walker, ætat 26; an English Agricultural Labourer; of 5 years and 8 months' service, in India 1 year and 5½ months, and at Aden since 5th March 1860. He had a severe attack of fever at Surat in 1859, and his health became impaired from that time. He had not felt well for several days before he was admitted, viz., on the 15th June, and he then had headache, pains of body, sense of lassitude, hot skin and other symptoms of "continued fever." Bowels were confined. There was an intermission of the symptoms for a few hours on the 19th, but with this exception there was very little improvement at any time. There was the same dark appearance of face as mentioned in the last case. On the 21st, as the temperature of the day increased, he became worse, delirious about 11 A.M., and soon afterwards insensible, with the pupils much contracted, and in this state he continued till the hour of his death, viz., 1-40 P.M. *Treatment.*—Purgatives, salines, calomel and James' powder

in small doses, tartar emetics with salines, cold applications and leeches to head, quinine in the intermission above referred to, and blister to neck, spoon diet, chicken broth, wine in small quantities with sago, soda water and lemonade.

POST-MORTEM APPEARANCES 19 HOURS AFTER DEATH. *Head.*—When the head was opened a larger quantity than is usually observed of blood and serum (mixed) escaped from the head and spinal canal; the veins of the dura-mater and pia-mater congested; no effusion of serum on surface of brain beneath the arachnoid; each of the lateral ventricles contained about 1½ drachms of limpid serum. Brain substance healthy. *Thorax.*—Heart dark-colored and rather soft; its valves healthy. Both lungs free from tubercular deposit and in other respects healthy. *Abdomen.*—Liver of natural size and healthy; gall bladder about half full of light-colored thin bile; *spleen* enlarged; kidneys healthy; intestines healthy.

CASE 11.—Serjeant Charles MacAuley, ætat 39; an Irish Linen Weaver of 20 years and 10 months' service, in India 2 years and 9 months, and at Aden since 5th March 1860. Of a very nervous temperament. Had been in Hospital with fever several times since March. Had not felt well for two days before he came to Hospital—on the evening of the 17th June—and he then had hot skin, feeling of lassitude, pains of body, epigastric uneasiness thirst, and other symptoms of "continued fever," but no headache. He was much better on the 19th, the febrile symptoms having in great measure disappeared, though he was restless, and appeared to be doing well till the 23rd at midday, when the heat of skin returned and he was much excited; this I attribute to the heat of the day and to a man being brought to Hospital with a broken neck. He became delirious at 8 P.M. and his pulse rose to 136. No increase of the heat of skin observed in the afternoon; pupils much contracted; and he died at 11 o'clock. *Treatment.*—Emetic, salines with antimony, calomel and James' powder, quinine for a short time, but it was omitted in consequence of its affecting the head, and the mineral acids and bark substituted for it; cupping to 6 oz. stimulants, spoon diet, beef tea, soda water.

POST-MORTEM APPEARANCES EIGHT HOURS AFTER DEATH. *Head.*—There was very little, if any, congestion of the vessels of the dura-mater. There was extensive effusion of serum beneath the arachnoid over the upper surface of the left hemisphere of the brain, infiltrating the tissue of the pia-mater, and looking like a thin layer of jelly. The serum escaped slowly when the arachnoid was punctured; over the right hemisphere there were two dark-red patches, the larger being rather more than one inch and a half in diameter, caused by inflammation of the pia-mater, and beneath them the brain was red on the surface and soft, a thin layer of it coming away with the membranes. There was fine sanguineous injection of the arachnoid at these places. No change of dura-mater nor other indication of disease presented, by the brain. *Thorax.*—Extensive emphysema of both lungs, and old

pleuritic adhesions of right side; no disease of heart. *Abdomen.*—Liver and other organs in this region healthy.

CASE 12.—Private Edward Shaw, ætat 20; an English Labourer of half a year's service. A case of remittent fever in a recruit who died at sea on his way out to join the Regiment. Head symptoms and delirium early set in, and with only two slight remissions; he died on the 6th day. The treatment, as reported by Assistant Surgeon FitzGerald, of the Indian Service, was by aperients, quinine, cold douche, and enemata of castor oil, turpentine and morphia. No post-mortem examination was made.

Hepatic Diseases.—Gujarat is not a part of India producing liver disease, and I have known those of the Regiment who suffered severely in the Mauritius find a complete immunity from this affection at Ahmedabad. The Regiment not having been many years in the country has something to do, doubtless, with the few cases that have originated. The total admissions were 27 hepatitis acuta and 26 hepatitis chronica.

The treatment in uncomplicated acute forms of the disease must be very decided, and with no delay; dozens of leeches only will make the disease knock under, together with calomel and hot fomentations. In the more chronic affection, blisters, with absorbents such as the hydro-chlorate of ammonia in a mixture with nitro-muriatic acid, I have found the most successful practice. With fever cases I have commonly observed some tenderness indicative of congestion of the liver, and then calomel with James' powder has proved useful. It has been asserted that mercury does not produce its peculiar effects on the gums of those suffering from purulent formations in liver, but I have had instances to the contrary. In spite of all we can do, sometimes abscess will form, and my experience leads me to believe that the under surface of the right lobe is its most common locale. There were four deaths during the year from this cause, and all at Ahmedabad, viz. :—

CASE 1.—Drum Major Joseph Noble, ætat 35, an English Labourer, of 21 years' service and 1 year on the station. Had been before in Hospital with symptoms of a similar nature caused by drink, and his present attack originated during his charge of the canteen. Pain over liver, inability to sleep, and irritability of stomach were the chief symptoms on admission, and which rapidly ripened into unmistakable hepatitis and delirium tremens; after four days some sleep was procured, but now friction sound and dulness at the base of the right lung complicated the case. Dyspnœa increased to a painful

degree and death followed on the 11th day. The *Treatment* was by calomel and opium, and antimony, blisters, beef tea, and wine.

Sectio Cadaveris hora xiii. post mortem. *Head.*—The membranes of the brain were more vascular, and the brain itself, when incised, presented more bloody spots than usual. *Thorax.*—There was much fat about the pericardium. The heart was large, but there were no appearances indicating disease. Left lung rather emphysematoses at the anterior margin, but in other respects healthy. There was concute fibrine in the right pleura which caused the lung to adhere to the side and diaphragm, easily broken. There was much congestion of the lung of this side and a small amount of hepatigation near the base. The liver large, filling the epigastrium and half of left hypochondrium, of a rather dark colour from congestion; much fat along the intestines. The upper half of the right kidney atrophied, its cortical part having almost entirely disappeared, and this appeared to be produced by pressure of the liver. The left kidney about twice the ordinary size.

Case 2.—Private William Harris, ætat 23; 6 years' service and 15 months on station. A case of acute hepatitis, rapidly running into abscess in spite of all treatment by numerous leeches, blisters, cal. and opii, &c. The post-mortem recorded an enlarged liver, which was adherent posteriorly to diaphragm and peritoneal covering of kidney on which it pressed, and on attempting to detach it the abscess burst, giving exit to about 4 oz. of pus. The gall bladder was empty.

Case 3.—Private William Hoadly, ætat 21; an English Farrier, of one year and 6 months' service and 7 months on station, and of temperate habits. This was an acute case of hepatitis with formation of an abscess on the 25th day, which did not point externally owing to its situation, salivation (which has been doubted in such cases) was produced, but without any alleviation to the symptoms, together with cal. ipecac. and opii, leeches. Death ensued on the 51st day.

Sectio Cadaveris hora vii. post mortem. *External appearances.*—Body greatly emaciated. *Head* not examined. *Chest.*—Lungs healthy and crepitating, the lower lobe of the right lung adherent to the walls of the chest in front and to diaphragm below by recent lymph exudation. The heart and valves normal. *Abdomen.*—Liver enormously enlarged, extending to about 7 inches below the margin of the ribs. It was bounded above by the 6th rib, below by a curved line drawn about 1½ inches above the crest of the ilium on the right side, extending across the abdomen a little below the umbilicus to the cartilage of the 11th rib on the left side. The organ was free from any morbid attachments except at the upper and back part of the right lobe, where it was tolerably firmly adherent with the diaphragm. On removing these adhesions a large abscess of the size of a cocoanut was found, giving exit to about two pints of thin curdy-looking pus; the interior of the abscess was lined by a thick layer of flocculent lymph exudation. The surface and structure of the rest of the liver was healthy. Gall bladder full,

but no obstruction. Stomach displaced, being pushed entirely below the left hypochondrium, lying with its cardiac and pyloric ends in the same line vertically. Both kidneys were greatly enlarged, their capsules easily separable; on making a section the pyramidal striated appearance of the uriniferous tubes were entirely absent in most places; the cortical portion thickened and encroaching on the tubular. The mucous membrane of the large intestine presented a red congested appearance, but no ulceration or lymph exudation. The spleen was natural.

CASE 4.—Private William Willis, ætat 27. This was a case of abscess of the liver after three years' residence in India in a temperate young soldier; internal rupture on the 15th day, and death immediately followed. The treatment was by leeches often repeated, calomel, p. jacobi, et opii, and blisters.

SECTIO CADAVERIS HORA VI POST MORTEM. *External appearances.*—Body emaciated and at present cold and rigid, with marks of leeches and blisters over right side. *Head* not examined. *Chest.*—The contents of the thoracic cavity were healthy. *Abdomen.*—The liver was seen to be enormously enlarged, extending from the 6th rib superiorly to within an inch and a half of the crest of the ilium on the right side inferiorly, and stretching across the epigastric region to the cartilage of the 11th rib on the left side. It had a pale granular appearance externally, and was free from morbid attachments. On introducing the hand down the inside of the abdominal wall for the purpose of removing the organ, the space was found filled with pus, and two quarts were easily removed with a cup. Turning up the liver, its right lobe was seen to be a suppurating mass, and had been the seat of an abscess the size of a large cocoanut, and which had eaten its way to within half an inch of the upper surface; the left stretching across to the left side was scarcely less healthy in appearance, but without any abscess. The spleen was enlarged, and of a pale slate color, but tolerably firm on section. Both *kidneys* were enlarged and their capsules easily removed; on section they presented a preponderance of white fatty matter, the pyramidal striated appearance of uriniferous tubes lost to sight, and the cortical portion thickened. All other organs appeared healthy.

Dysentery and Diarrhœa.—Neither of these complaints can be considered to form any portion of the prevalent diseases of Gujarat, and the regiment has been very free from them. The admissions have been 55 from the former and 116 from the latter, and the deaths three and two. One death occurred at Bombay and of which I have no account, and one whilst upon Field Service after rebels, and therefore no post-mortem was made. The particulars connected with the other fatal cases I now proceed to give, first premising that I have been very successful in the treatment of dysentery in this country, by the

means described at some length in a former Annual Return in the Mauritius; and without unnecessarily adding to the length of this report, I may give a case* as illustrative of that treatment, but which could be oftentimes repeated from my Case Book, showing the same successful result.

CASE 1.—Private Daniel Pockets, ætat. 30; of one year's service, and only two months on station. Whilst on the march from Bombay to Ahmedabad pills of calomel and opium were given him by Assistant Surgeon Kearney to stop an obstinate diarrhœa, and which caused excessive salivation of protracted duration and ulceration of tongue; he was in this state when first brought under my notice, and during the lengthened treatment in Hospital for which he became the subject of dysentery. He was treated principally by acetate of lead and opium, with injections, but his previously debilitated state hastened the fatal issue, and he died after 36 days' treatment.

SECTIO CADAVERIS HORA IV. POST MORTEM. *External appearances.*—Body greatly emaciated and rigid. *Head* not examined. *Chest.*—Lungs and heart looked healthy. *Abdomen.*—No fluid in cavity, omentum natural, also the small intestines. Externally the colon and rectum showed inflammatory redness in some parts, and in others the highest degree of lividity. On opening the large intestines, their calibre was seen to be diminished by a general tumefaction of their coats, and the colon in some parts was nearly quarter of an inch thick; their villous coats ulcerated in several circular and very many irregular large spots, so as to present the appearance of having been worm-eaten, and the whole besmeared with bloody mucous. The other abdominal organs were healthy.

CASE 2.—Private Joseph Moore, ætat. 19; of two years' service, and nine months on the station. This was an instance of diarrhœa and dysentery attacking a young soldier soon after his arrival in India; no relief following treatment, which consisted chiefly of acetate of lead and opium, astringents, calomel and opium, and anodyne injections, with blisters to abdomen. Death on the 27th day, from perforation of colon.

SECTIO CADAVERIS HORA VII. POST MORTEM. *External appearances.*—Body emaciated and rigid; marks of blistering over abdomen. *Head* not examined. *Chest.*—The lungs and contents of thoracic cavity appeared healthy. *Abdomen.*—The liver was large and contained an abnormal quantity of white matter in its composition; it was slightly adherent laterally to the abdominal walls; about the centre of its upper surface was a hard discolored knob of the size of a walnut, which on incision was found to contain about ℥iv of greenish pus. Gall bladder was distended, but no obstruction. The *spleen* was considerably elongated, but of a natural slate-color externally, and firm on section. The *intestines* were matted together, and glued to the

* See next page.

omentum by effused lymph; the small intestines were empty and had a natural appearance; the chief disease being found in the large intestines, particularly in the colon, where suppuration and ulceration had occurred; there was great hypertrophy and thickening of all its coats to the extent of fully quarter of an inch, the rugæ greatly enlarged, so that the inner surface was exceedingly rugged; the glands were much hypertrophied, and the whole inner surface of this intestine had a worm-eaten appearance; perforation had occurred in several places. All other organs were healthy.

CASE 3.—Private James Day, of one year's service, and seven months on station. Although marked as diarrhœa, was really one of inanition; the man at the time suffering severely from secondary syphilis. He was once a professional jockey, and a relative of the celebrated man of that name, and of slight build. He was 25 days under treatment, first for periosteal pains and sore throat, then diarrhœa and atrophy; no amount of nourishment appeared to relieve his starved look. The *treatment* was chiefly by astringents and tonics.

SECTIO CADAVERIS HORA VII. POST MORTEM. *External appearances.*—Body extremely emaciated, rigid, and cold. *Head* was not examined. *Chest.*—The lungs were pale, but not otherwise unhealthy. The *heart* contained fluid blood of a very dark-black color; its valvular arrangements were all perfect, but its walls were attenuated, and its muscular substance pale. *Abdomen.*—Liver was natural; spleen firm; kidneys small; and the intestines all empty; no ulceration or inflammatory thickening of their lining membrane to be seen. All the internal organs had an unusually pale aspect, and the body generally looked imperfectly nourished. The blood was everywhere fluid.

Case of Acute Dysentery successfully treated with Ipecacuanha.

No. 504, Private John Davis, ætat. 21; one year's service and two months on station. *March 15th* 1860.—Was brought to Hospital in a dooly at 2 P.M., stating that about two hours before he was much purged for the first time, and that it has been incessant ever since. Stools mixed with blood and slime; pulse 84; skin hot. ℞ tinct. opii ℥i stat. sumd. ex aquâ. Applic. cataplasm. sinapis epigastrio.

4 P. M.—℞ pulv. ipecac. gr. xv. in pil. iij st. sd. et primo cras mane, ol. ricini ℥vi.

16*th March.*—No vomiting after the pills; bowels only moved three times since admission, but stools contain blood and slime; he complains greatly of tenesmus; no abdominal pain; tongue clean. ℞ pulv. ipecac. gr. ij 3tia q. q. horâ sd.

17*th.*—Bowels moved once this morning and not at all during the night; stools loose, but very little mixed with blood or slime; no appetite. Pulse 76. Cont. pulv. ipecac.

18*th.*—Bowels moved once last night; no blood or straining present; skin natural. Omitt. pulv. ipecac.

20*th*.—Has gradually improved since last report, and is this day discharged *cured*.

Remarks.—The employment of ipecacuanha in dysentery has undergone considerable changes from the time when it was styled the radix ante-dysenterica, till when Pareira wrote that in the severe forms of this disease no one would now think of relying on it. In the present day, however, we find in India, it is used with great success. Probably its mode of action is principally on the liver, from which a flow of bile is produced; by this means the portal vessels are partly unloaded, and therefore the congestion of the mesenteric veins is diminished.

Cholera is one of the curses of this country to Europeans, but few out of India have any adequate idea of the extent its fearful ravages annually cause to the native population. Last summer, during the month of June, 100 deaths per diem occurred in the city of Ahmedabad, for a short time. Three miles from our camp, and in all the surrounding villages death from this disease was busy: nor was it confined to this month, except to its greatest mortality, for throughout the year death from this cause has been rife. The 4th (King's Own) Regiment must be considered to have had a remarkable escape, particularly as the deaths from cholera in the two Native Infantry Regiments in the same camp were very numerous, causing one of them to go away for a time under canvas. There can be no doubt that the powers we possess for the resistance of this disease depend greatly upon circumstances over which we have control, and that cholera is most widely-diffused and most fatal in its attacks in localities where the laws of hygiene have been violated.

The total number of admissions from this disease were 26, of which number eight deaths occurred at Ahmedabad, one at Surat, and three on Field Service.

I have nothing new to advance either as to the pathology or treatment of cholera. I have tried chloroform largely, but not with greater success than other stimulants. There is one peculiarity, however, which I may notice among cases which happened during the year, that of marked improvement of the symptoms for two or three days, and then sudden death by coma from suppression of urine; such an unsatisfactory termination has happened to me more than once.

The following case, selected from many in the Case Book, will illustrate my meaning :—

Private William Harkins, ætat. 23 ; of one year's service and three months in India, was brought to Hospital in a dooly at 4-30 P. M. on the 18th April, complaining that soon after his breakfast this morning he was attacked with purging and vomiting. At present his pulse is very feeble, and he complains of some pain in the stomach ; mouth dry, and he has much thirst ; skin warm. R spt. ammon. co. ℥i, tinct. opii ♏ xv. mist camphor ℥iss. m ft. haustus st. sd.

4-40 P. M.—Slight cramps in abdomen ; had one stool which was bilious and contained large pieces of undigested potatoes. R liquor ammon. fort. ♏ v. mist. camphor ℥i omni quadrante horâ sd. R calomel gr. v. opii gr. i. in pil. st. sd. (brandy ℥ij)

5 P. M.—Cramps have set in the legs ; stools rice watery ; voice changed. R. chloroform ♏ xv. mist. acaciæ ℥i st. sumd. utatur friction é spt. terebinth. diligenter.

5-30 P. M.—Cramps in legs very severe. Utat. fric. chloroform cruris ; skin becoming blue and corrugated. Hot bottles.

7-30 P. M.—No vomiting nor purging, going on well ; arrowroot and port wine.

10 P. M.—Cramps returned in legs and also in hands ; just past a rice watery evacuation ; skin colder and pulse scarcely perceptible at the wrist. R tinct. cinnam. co. ℥ij., ol. menth. pip. ℥iss, ol. cajaputi ℥iss, ol. anisi ℥iss, acid sulph. arom. ℥ij, mft. guttæ, minim x. omni horâ.

12 P. M.—Cold skin and scarcely perceptible pulse ; brandy 2 oz. every hour.

19*th*, 6 A. M.—Appears worse. Had three stools in the night, the last tinged brown ; body cold and clammy ; no pulse ; no return of cramps. R camphor gr. iij pulv., opii gr. i pulv., cayene gr. iss ft. pil. omni horâ 3tia cum spt. vini gallico ℥ij. Has passed no urine since admission.

12 NOON.—Continues in much the same state ; no vomiting, purging, or cramps. Arrowroot and wine.

6 P. M.—Says he feels better ; no return of bad symptoms (took 5 pills and 10 oz. brandy) ; pulse is still scarcely to be felt at the wrist, and the surface of the body continues cold and clammy. Cont. pil. sine opio ; cont. guttæ et friction.

8 P. M.—More lively ; asks for a cup of tea ; slept the last two hours. Body continues cold. (Extra tea), arrowroot and wine.

20*th*—Has passed a good night and slept soundly at intervals ; no return of active symptoms, but has passed no urine yet, nor is there any in the bladder. No medicine.

4 P.M.—Just passed three involuntary stools, and there is a sudden appearance of comatose symptoms ; skin is warm ; no pulse at wrist. Applic. mucha emplast. cantharid amplum.

10-30 P. M.—*Died suddenly. No post-mortem examination.*

INSOLATIO, OR

A TABULAR RETURN of CASES of "HEAT APOPLEXY" which occurred

Number.	Rank and Name.	Age.	Habits.	Where attack occurred.	Date.	Time of Seizure.	History.	Chief Symptoms.	Treatment.
1	Private William Marks.	22	Temperate	Regimental Hospital, Ahmedabad.	1860 8th June.	5 P.M....	Admitted into Hospital for fever the previous day, and attacked whilst a patient in Hospital and not exposed to the sun.	First observed to be restless and loquacious, then had headache and a hot skin, full pulse, and parched lips, pupils had a vacant stare, and insensibility followed with stertorous breathing.	1st, Head shaved; 2nd, cold douche; 3rd, leeches to temples; 4th, turpentine enema; 5th, brandy.
2	Private Thomas Knight.	19	Ditto.	Barrack room at Ahmedabad.	23rd June.	3·30 P.M..	Has not been exposed to sun, but suddenly became insensible in Barrack room.	Sudden stupor followed by heat of skin, red face, beating carotids, injected conjunctivæ, full pulse, and convulsions, requiring 4 men to hold him.	1st, emetic; 2nd, cold douche; 3rd, head shaved; 4th, leeches; 5th, enema; 6th, brandy and ammonia.
3	Private Patrick Connelly.	26	Ditto.	Ditto.	26th June.	3·30 P.M..	Commenced by fever; had not been exposed directly to sun.	Burning skin and headache, followed by insensibility and stertorous breathing.	1st, emetic; 2nd, diaphoretic; 3rd, ant. tart; 4th, cold douche; 5th, leeches.
* 4	Private Walter Blake.	19	Ditto.	In a tent on Field Service at Tasra.	2nd June.	10 A.M. ..	Had fever for one day previous to attack.	Vertigo headache; great heat of skin; delirum; coma.	1st, V. S.; 2nd, cold douche; 3rd, turpentine enema; 4th, ammonia.
* 5	Private Alfred Duvall.	28	Ditto.	In a tent on Field Service (Aluna).	9th June.	5 P.M.	Sudden insensibility whilst encamped in a tent; supposed to have been drinking native liquor.	Insensibility, stertorous breathing, great heat of skin, and quick pulse.	1st, ammonia; 2nd, cold douche; 3rd, turpentine enema; 4th, blister to head.

* The cases from Nos. 4 to 10 were under care of Assistant Surgeon Kearney.

HEAT APOPLEXY.

in the 1st BATTALION 4th (KING'S OWN) REGIMENT during the year 1860.

Duration of Disease.	Mode of Death.	Previous Health.	Post-Mortem Results.			Meteorological Table.		Other Diseases Prevalent.	Supposed cause.
			Head.	Thorax.	Abdomen.	Temperature.	Other states.		
10 hrs.	Comatose.	Weakened by fever.	8 oz. of dark fluid blood.	Posterior and inferior parts of each lung densely congested and impervious to air.	Liver on section gave out freely a flow of dark blood; spleen lobulated but not much congested.	96°	Very sultry, dry; no wind.	Fever and cholera.	Sultry heat.
4½ hrs.	By convulsions.	Good ..	6 oz. of dark fluid blood escaped from vessels of scalp and sinuses, vessels of pia-mater much congested, brain pink & congested, choroid plexus, no serum	Both lungs intensely engorged, and in many parts impervious to air and fleshy on section.	Liver congested with dark thick blood; spleen healthy.	94°	Very sultry afternoon.	Ditto ..	Ditto.
2 days.	Comatose.	Ditto ..	Sinuses and vessels gorged, substance of brain vascular	Lungs gorged posteriorly with blood and serum.	Liver healthy; spleen healthy.	93°	Sultry, dry.	Ditto ..	Ditto.
3 hrs.	Ditto ..	Weakened by fever.	No Post-Mortem.			104°	Sultry....	Ditto ..	Great heat and not sufficient protection under canvas.
½ of an hour.	Ditto ..	Good ..	Ditto			104°	Thunder and Lightning.	Ditto ..	Ditto.

Number.	Rank and Name.	Age.	Habits.	Where attack occurred.	Date.	Time of Seizure.	History.	Chief Symptoms.	Treatment.
					1860.				
* 6	Private Alfred Lloyd.	21	Temperate	In a tent on Field Service at Somnapore.	7th June.	7 P.M.....	Brought to Hospital comatose from his tent.	Burning skin, stertorous breathing, red face and fluttering pulse.	1st, cold douche; 2nd, ammonia; 3rd, turpentine enema; 4th, blister to neck.
* 7	Private Samuel Turner.	26	Ditto. ..	On Field Service Tasra.	8th June.	7·30 A.M..	Attacked whilst pitching a tent.	Sudden insensibility and stertorous breathing; no convulsions.	Ditto ..
* 8	Private Thomas Griffin.	22	Ditto. ..	At Tasra on Field Service.	Ditto.	Ditto ..	Attacked whilst pitching a tent.	Ditto .	Ditto ..
* 9	Private David Davies.	21	Ditto. ..	In a tent at Tasra.	Ditto.	Ditto ..	Ditto.	Ditto ..	Ditto ..
* 10	Private William Linnett.	20	Ditto. ..	Ditto.	9th June.	3 P.M.	Attacked in a tent whilst under treatment for fever.	Ditto ..	Ditto ..
11	Private Patrick McKey.	35	Ditto. ..	Aden. ..	6th June.	2·30 P.M..	Had just come off Guard.	Feverish symptoms at commencement, followed by insensibility and burning dry skin.	1st, Cold douche; 2nd, aperient; 3rd, enema; 4th, stimulants.
12	Private Patrick McGeary.	19	Ditto. ..	On Parade at Ahmedabad.	23rd June.	6·30 P.M..	Contracted on Parade on a very sultry afternoon after the sun had set.	Vertigo headache; great heat of skin; insensibility; full pulse and injected eyes.	1st, Cold douche; 2nd, leeches and brandy; 3rd, ammonia; 4th, quinine.
13	Private William Little.	25	Ditto. ..	In Barracks Ahmedabad.	30th June	5 P.M.	No direct solar exposure to sun, but attacked in Barrack room on a very sultry day.	Sudden insensibility and the usual heat of skin.	1st, Cold douche; 2nd, leeches; 3rd, enema terebinth; 4th, brandy.

* The cases from Nos. 4 to 10 were under care of Assistant Surgeon Kearney.

Duration of Disease.	Mode of Death.	Previous Health.	Post-Mortem Results.			Meteorological Table.		Other Diseases Prevalent.	Supposed cause.
			Head.	Thorax.	Abdomen.	Temperature.	Other states.		
3 hrs.	Comatose.	Good ..	No Post-Mortem.		....	105°	Sultry ..	Fever and cholera.	Great heat, and no sufficient protection, under canvas.
4½ hrs.	Convulsed.	Ditto ..	Ditto		....	110°	Ditto ..	Ditto ..	Extreme heat and exposure to sun after fatiguing march, and having to wait for arrival of tents.
3 hrs.	Coma ..	Ditto ..	Ditto		....	110°	Ditto ..	Ditto ..	Extreme heat and exposure to sun after fatiguing march.
4½ hrs.	Ditto ..	Ditto ..	Ditto		....	110°	Ditto ..	Ditto ..	Ditto.
3 hrs.	Ditto ..	Weakened by fever.	Ditto		....	105°	Ditto ..	Ditto ..	Extreme heat and insufficiently protected by canvas.
2 hrs.	Ditto ..	Good ..	Slight congestion only; no serous effusion.	Fatty heart; right lung adherent to walls of chest; no congestion described.	Spleen three times its natural size and very soft.	100°	Ditto ..	Fevers ..	Sultry heat after fatigue.
30th June Discharged.	Cured ..	Ditto ..		.....		90°	Very sultry.	Fever and cholera.	Extreme heat.
3rd July Discharged.	Ditto ..	Ditto ..		.....		94°	Ditto ..	Fevers ..	Ditto.

REMARKS.—Since the unhappy events which have necessitated the continued residence of a large force in India, the subject of coup-de-soleil has become one of the first importance. In many places it has created almost equal havoc and is as little amenable to treatment as the arch-scourge cholera itself.

The true seat of the disease, the *fons et origo mali*, is as yet unknown; and it would seem as if proportioned to its importance, the pathology is as little understood. That our knowledge of the deranged conditions related to elevated temperature is only imperfect is apparent in the various designations given to them, viz:—

Insolation—Known also as coup-de-soleil, sun-stroke, ictus solis, heat apoplexy, heat asphyxia, cerebral and sun fever, erethismus tropicus, ardent continued fever—besides having been mixed up with remittent fever—meningitis, phrenitis, and also denominated arachno-cerebritis, phrenismus, carus ab insolatione, and typhomania. From all of which I prefer the term heat apoplexy. The average *mortality* has been asserted to be about 80 per cent. of soldiers attacked; 66 amongst officers; all the children; whilst women, from being so seldom exposed to the sun, are rarely victims.

In the present return the mortality was at the rate of 84 per cent., but then it must be remembered that the majority of these fatal cases occurred in young soldiers scarcely six months in the country, called upon active field service in the very hottest part of the year.

Symptoms depend very much upon the mode of attack, that is to say, whether the heat apoplexy has been the result of direct exposure to the sun, or whether the man was in an active or passive state at the time. For sometimes persons are seized in the shade or under cover, as in the first three of the foregoing cases, when the symptoms advance with diminished rapidity comparatively; the patient complaining of feverish debility in the morning and being found in a state of stupor in the afternoon. The symptoms again, besides varying according to the severity of attack, will be modified by the constitution or temperament of the patient. Great heat of skin, preceded by

vertigo and headache, and vomiting and a devouring thirst, are always present, with a feeling of heavy weight just below the ensiform cartilage—*à besoin de respirer*—injected conjunctivæ, sometimes a swollen face and at first a full pulse ; these are the symptoms if the patient is seen early. After which, if the treatment is unavailable towards any improvement, a sinking pulse, great prostration of strength, diminution of heat of skin, a great desire to sleep, loud moaning, and sometimes frothing at mouth, and death by convulsions or coma. I have always found the pupils sensible to light. I have never seen a case of instantaneous death from sun-stroke.

Treatment must depend upon the stage of the disease the patient is first seen in, and requires much discrimination and judgment. If the patient is seen in a severe attack at once, the treatment usually adopted was to apply leeches to temples and behind ears, cold douche to the head so as to rouse the nervous energy and administer calomel and croton oil to act on liver and move the bowels, as well as to throw up an enema of warm water ; the derivative effects of heat applied to the extremities sometimes does good.

As the greatest of all desiderata is the return of the action of the skin, an emetic of ipecacuanha should be early given ; the act of vomiting tending most powerfully to induce perspiration. Beyond a certain duration, the direct application of the cold douche is apt to be injurious, by interfering with any attempt to increase the action of skin ; for if remedies be given which tend to increase perspiration, their action will certainly be hindered by the application of anything to the skin which has a lower temperature than that of the body. Hot infusion of tea has been recommended by a late writer on this subject, who states that the action of the tea, besides that on the skin, is directly to increase the vital action through the medium of the nervous system.

The time for active measure being past, stimulants, as brandy, ammonia, and perhaps small doses of laudanum are the chief means to be relied on ; together with heat to extremities, mustard

sinapisms to cardiac region, shampooing, turpentine enemata, and the Marshall Hall "ready method."

Pathology.—Intense pulmonary engorgement is always present, and a vascular dry reddish appearance of the brain. I never saw *serous* effusion beneath the cerebral membranes nor in its cavities, and which is its distinguishing feature from remittent fever; there is generally an oozing of dark-colored blood on a section of the brain substance from innumerable puncta-vascolosa.

Causes.—Excessive heat producing rarefaction of the air, causes a diminished supply of oxygen in respiration, whereby the blood becomes deteriorated, and throwing extra work upon all those organs that free the blood from matters that are injurious to the system, soon results in a suspension of their functions, viz., lungs, liver, heart, and kidneys, while the skin from the extreme heat ceases to act, and an amount of internal heat is thus accumulated which soon proves destructive to the function of life.

Prevention.—Avoidance of the sun as much as possible is the great point to attend to; attention to clothing and ventilation; if in barracks keep them cool by punkahs and tatties; if unfortunately obliged to live in tents, or be on the march during the hot months, an extra number of tents and bheesties should be provided, also privy tents, and a good pith helmet constantly worn.

Disease of the Chest.—The total admissions from these causes according to the annexed return number 52, of which four were fatal—two in Hospital and two out of Hospital—viz., one case of phthisis pulmonalis in a Drummer Boy John Murphy, ætat. 18, of stunted growth, and much addicted to drink.

He had been frequently in Hospital previous to his last admission, which was on the 2nd February 1860, and he died on the 3rd of the following month. He was treated in the usual way by a nutritious diet, cod liver oil, expectorants, sedatives and tonics.

SECTIO CADAVERIS HORA VII. POST MORTEM. *External appearances.*—Body emaciated to last degree. *Head* not examined. *Thorax.*—Both lungs

small and scarcely a particle of healthy tissue remaining in their composition; each was riddled with tubercles of various degrees of softening, and varying in size from a millet seed to a pigeon's egg, the large containing liquid pus. The *heart* was remarkably small and its walls attenuated, with healthy valvular action. *Abdomen.*—Liver was small and congested; gall bladder full. The kidneys were of double their natural sizes, comparatively with the other organs, and fatty degeneration had commenced in each. The spleen and intestines were healthy.

A case of Pneumonia occurred on Detachment at Baroda. Private James Hayes was admitted into Hospital on 30th January and died on the 21st of March: the symptoms were not well marked, being complicated with hepatic disease; and from a perusal of the history of the symptoms in the Case Book kept by the Assistant Surgeon in charge, I am inclined to think that the cause of death was an hepatic abscess bursting through the diaphragm into the right lung. The chief treatment was by leeches, blisters, and calomel and opium.

POST-MORTEM EXAMINATION EIGHT HOURS AFTER DEATH.—The man having for a very long time been gradually sinking, the body was much emaciated. On opening the chest, the right lung was found adherent to the pleura all over its lower part. In the right lung, at its base, was a large cavity containing a quantity of foul smelling and partly decomposed pus. This abscess communicated through an ulcerated opening in the diaphragm with a larger one in the substance of the liver; both cavities were lined with thickened walls of hard organized lymph; and the common abscess formed by their coalescence was entirely shut off by adhesions of lymph from the cavities, both of the abdomen on the one hand and of pleura on the other. The heart, kidneys, and other viscera presented no abnormal appearances.

A case of Aneurism of the Aorta occurred in an old soldier, transferred from the 78th, and who had been fifteen years in India and had been invalided to England for hepatic disease, and just as he got on board ship he dropped down dead without any premonitory symptoms of such complaint. His body was removed to the Colaba Depôt at Bombay, and the Medical Officer sent me the following account of the *post-mortem examination*:—

Externally.—Body stout, not in the least emaciated; marked with livid blotches on all the dependent portions. *Head,* not examined. *Chest.*—The different organs generally congested. On opening the pericardium the cause of death was at once apparent. The pericardium was distended with a large effusion of clotted blood. The source of this was discovered to be a

moderately sized aneurism of the ascending aorta which had burst by two openings into the pericardium just at its angle of reflexion. The heart itself was loaded with fat. The aortic valves were contracted. The cause of death being so obvious the examination was not extended to other organs.

Diseases of the Sexual Organs.—There is nothing important to record under this head : the admissions were 251, not being more than the average : mercury not used.

Ophthalmia.—The regiment has been remarkably free from ophthalmia. The few cases in the return being simply catarrhal conjunctivitis, and chiefly occurring at Aden.

Surgical Contingencies.—The ordinary catalogue of contusions, subluxations and simple wounds are embodied, and from which no permanent disability has been in consequence. One simple fracture of radius, one of fibula, and one of dislocation of thumb and right shoulder also occurred.

Officers, Women, and Children.—A few cases of fever have from time to time happened among the Officers, and one death from cholera in Ensign Bayley, a few weeks after his arrival in India (a detailed Report of whose case has been previously rendered), the disease being prevalent at the time in the camp and neighbourhood. Two officers were invalided to England from Head Quarters, one for icterus and one for nephritis, and one from Surat Detachment for obstinate dyspeptic symptoms.

The women and children of the regiment have been healthy. One woman died from remittent fever during the hot months, two children from cholera, one from variola, four from diarrhœa, one from dentition, one from atrophy, and one from hydrocephalus.

Meteorological Observations, showing the Temperature of the Air, the fall of Rain, the prevailing Winds, and the variations in the Weather.

Year and Months.	Temperature of Air.			Rain.		Wind.
	Highest in Month.	Lowest in Month.	Range in Month.	No. of days it fell.	Amount collected.	General directions.
1860.					ins.	
January ..	79°	53°	26°	1	·10	N. E.
February..	84	59	25	..	..	E.
March ..	95	69	26	..	..	S. W.
April	91	73	18	..	..	N. E.
May	93	81	12	4	·18	S. W.
June	98	85	13	3	2·40	S. W.
July.....	93	79	14	13	13·90	S. W.
August .	86	78	8	11	6·60	S. W.
September.	92	80	12	4	4·10	N. W.
October ..	93	68	25	..	..	N. E.
November .	86	62	24	..	..	N. E.
December .	80	60	20	..	..	N. E.
Mean ..	..	..	..	36	27·28	..

TYPHOID FEVER IN INDIA: ITS CLINICAL CHARACTERS, MORBID ANATOMY, AND ETIOLOGICAL RELATIONS.

BY W. HANBURY, ESQUIRE, SURGEON, 33RD FOOT.

Presented December 1861.

I AM desirous to invite attention to a form of fever which occurred in the 33rd Foot stationed at Deesa, in the autumnal months of 1859, the morbid anatomy of which was of a kind at least unusual in this country. My experience among British troops in India, extending over a period of more than ten years, has not furnished me with examples of similar changes of structure in any disease, nor am I aware that they have ever formed so prominent a feature of fever in any previous description of the various types or forms which it assumes in this country. As the interest of the disease rests mainly on the morbid changes disclosed after death, and the clinical history and character of the affection can be fully exhibited in the description of the fatal cases, I shall refer to these only. The identity of the subject will thus be preserved, and no doubt will arise as to the real matter under consideration; but it will be readily understood (though we do not affect to diagnose them) that a large number of cases of fever, which at this time terminated in recovery, presented symptoms greatly resembling those which characterized the cases we have selected for observation. Next in importance, however, to the pathology of any disease are its etiological conditions; in this instance they are especially deserving of attention, and it will be necessary not only to state them with even more than ordinary precision but to note particularly the consequences of their removal. The disease in its sanitary relations was indeed full of significance and highly instructive; and it will

be found that the conditions under which it occurred, as well as the absence of these conditions, determined the standard of health and physical efficiency of the troops, and shaped, in a great degree, the medical history of the regiment during the whole period of its service in Guzerat.

Case 1.—J. W., aged 16, admitted 20th August 1860, with ordinary symptoms of pyrexia; but tongue is white, and pasty with red tips and edges, and there is considerable depression.

August 23rd.—Depression and weakness have increased, and face has a sunken appearance; there is however little heat of skin, and pulse is rather slow; bowels are not purged, but there is an excited state of the tongue, and dejections present an unhealthy aspect; being of a dark-yellow colour.

August 24th.—General symptoms evidence more asthenia; tongue is somewhat dry and still red, and articulation is difficult through want of power; no abdominal pain is complained of, nor does pressure easily elicit the expression of any. On deep and forcible pressure however, in the situation of the cæcum, ileum, and part of the ascending colon, pain and shrinking are produced, and there is some gaseous gurgling heard there. Dejections of a dark-yellow colour.

August 25th.—There is still greater asthenia to-day: he now lies in a semi-lethargic state, countenance collapsed, tongue is dry and red at point and edges, and protruded with difficulty; articulation still more imperfect; pulse small, but not much accelerated; dejections, voided three or four times in the 24 hours, are liquid and of dark unhealthy appearance.

August 26th.—A tendency to stupor is observed this morning; great difficulty of articulation exists, and tongue can scarcely be protruded; heat of skin has been moderate throughout; dejections are still of the same character, and pulse is small and feeble.

August 27th.—Sank gradually during the day, and died from asthenia about 6 p. m. last evening.

Autopsy 12 hours after death. *External appearance.*—Body somewhat emaciated and marked by blister over cæcum. *Thorax.*—Lungs much congested throughout, especially posteriorly. *Abdomen.*—Liver congested, but remarkably healthy in structure. The upper two-thirds of ileum presented nothing abnormal, lower-third was of a purple colour in several places externally, but the peritoneal coat was smooth, moist, and devoid of all traces of disease. Mucous membrane of the lower part of the gut was injected over some extent of the canal, the vascularity of a dark, livid, passive character, and presenting an arborescent appearance. Gangrenous ulcers were observed on the ileo cæcal valve and three or four ulcers in the lower part of ileum, while in some places the mucous lining was found to have been thrown off in oval patches half an inch in length by sloughing or ulceration.

Large intestine was free from all indications of disease, but there was a submucous melanotic patch observed at one part of the canal, and the calibre of the lower part of the intestine was contracted.

Case 2.—H. M., aged 23, suffered from a severe and protracted attack of fever in May and June 1859, and continued weak and exsanguined from the date of his discharge on the 22nd of June till the 11th of September, when he was again admitted with grave symptoms of fever, namely, loss of appetite, tendency to collapse, headache, feeble pulse, heat of skin, and foul tongue coated with a glairy mucus.

September 12th.—There is no improvement to report; he lies in a feeble apathetic and prostrated state, heat of skin alternates with diaphoresis of a somewhat passive character; tongue presents the same appearance, and there is no appetite; bowels have been moved two or three times, and the motions are liquid, though presenting a healthy bilious character.

September 13th.—Symptoms are still more unsatisfactory to-day, and a great tendency is observed to the development of a lethargic state, prostration and collapse; pulse is slow and feeble; tongue continues moist, and is covered with a glairy mucus; flushes of heat alternate with feeble diaphoresis.

September 14th, 8 A. M.—During the last two hours has passed into a most alarming state of collapse, and is now with difficulty made to swallow anything; trunk is warm and covered with profuse diaphoresis; pulse is scarcely perceptible at the wrist; pupils are contracted; he is quite unable to protrude his tongue, and he is scarcely sensible to the vapours of ammonia.

September 15th.—Sank gradually during the day; transient flushes alternating with profuse passive diaphoresis, and he died at 3 in the evening.

Autopsy 17 hours after death. *Thorax.*—Lungs somewhat congested; heart small and deficient in muscular development. *Abdomen.*—Liver normal as regards size and colour, but somewhat friable and easily broken down; intestines presented no traces of inflammation externally, but were of a pale pink colour, deepening in shade towards the lower end of the ileum; the coats of the small intestine were somewhat thinned, and of the lower third of it there was more or less softening. On cutting into this part of the canal ragged sloughing ulcers, almost penetrating the bowels, were presented in several patches—more numerous towards the cæcal end of the small intestine. The ileo-cæcal and colic valves were destroyed by gangrene, but in the upper part of the cæcum, although the mucous membrane was softened and of a pink color, the lesion of texture did not extend beyond enlargement of some solitary glands, and mucous follicles, with here and there points of incipient ulceration.

Case 3.—W. W., aged 31, admitted 8th August 1859, affected with debility, loss of appetite, and slight heat of skin, and relaxed bowels; pulse was

languid and feeble; respiration hurried and superficial, though physical signs of disease of the chest were absent.

August 9th.—Continues in a weak unsatisfactory state, and though there is scarcely any heat of skin, he lies in a feeble depressed condition, respiration being hurried and superficial.

August 11th.—Little change has occurred; breathing is hurried and shallow, and head and chest are bathed in perspiration; depression and loss of appetite continue; tongue is rough and dry at point, but not red, and pulse of tolerably good volume; respiratory sounds distinct on auscultation.

August 13th.—Has not improved; dejections are fetid, liquid, and slate-coloured; there is tenderness on pressure over the right and left iliac regions; tongue is rough and coated; pulse soft and tolerably regular; chest resonant.

August 15th.—Was somewhat delirious last night; tongue is dry and sordes collects on the teeth; is very deaf; and there is a copious discharge from the bowels of liquid dark and fetid evacuations two or three times daily.

August 16th.—Is much worse; signs of nervous exhaustion are now more apparent; tongue is protruded slowly, and hands are tremulous; an offensive slate-coloured fluid is discharged from the bowels in considerable quantity; pulse tolerably good; skin hot and dry.

August 17th.—Continues to lose ground; tongue is moist, and pulse of good volume, but skin is hot and somewhat dry; the tongue is protruded with difficulty, and there is a tremulous motion of the hands, and the bowels are still purged.

August 18th.—Is much worse to-day; he is constantly talking to himself in a state of muttering delirium; is now unable to protrude the tongue; and dejections dark liquid and fetid are voided in bed.

August 19th.—Symptoms are still more unfavorable; he lies on his back in a perfectly helpless state, muttering incessantly, and pulse is losing volume; there is floccitation, and the dejections are voided in bed.

August 20th.—Sank rapidly since yesterday, and died at 6 A. M. this morning.

Autopsy five hours after death. *External appearance.*—Considerable emaciation and marks of blisters over each iliac region. Abdominal walls protuberant, and tympanitic; small intestines presented no marks of inflammation, on the peritoneal coat, but close to the ileum they were of a dark-purple colour. In the upper two-thirds of the canal the mucous membrane was of normal appearance and structure, but in the lower third there were several gangrenous ulcers or rather patches covered with a sloughy grey membrane like dirty tow, and more numerous near the cæcum. Interspersed between these ulcers were enlarged glands or follicles filled (apparently) with a cheese-like substance and in a state of incipient ulceration or gangrene. The mucous membrane wherever it remained was of a dark colour, and the ileo cæcal and colic valves were also destroyed by the gangrenous process. The mucous membrane of the cæcum and part of the ascending colon was the

seat of several ulcers or gangrenous spots but of a less size, and the glands and follieles were dilated with a cheesy matter, passing at several points into uleeration. A dark inky fluid filled the whole traet of the large intestine, and the blood of whieh it was in great part eomposed was probably thrown out to a great extent from the irregular gangrenous surfaee resulting from destruetion of the valves mentioned above. The liver and kidneys presented nothing unusual in appearanee or structure.

Case 4.—T. P., aged 20 years, admitted 22nd August with general symptoms of fever.

August 24th.—Slept badly; tongue furred in the centre and of a bright red colour at the tip and edges; bowels relaxed; pain is eomplained of on pressure applied to the abdomen.

August 25th.—No improvement has occurred, and he has been delirious during the night.

August 26th.—Slept well last night, and is mueh quieter and better to-day; tongue of a red eolour still; does not eomplain of pain anywhere.

August 27th.—Pulse is very weak, and he is restless; muttering and tossing about very mueh; tongue moist, but unnaturally red; skin eold; bowels moved twiee sinee yesterday.

August 27th, 5 P. M.—Beeame gradually weaker during the day, and died at 5 o'eloek this evening.

Autopsy 16 hours after death. *Thorax.*—Heart and lungs were found in a healthy eondition, the latter were however somewhat eongested. *Abdomen.*—Liver exhibited no traee of disease; the peritoneal eovering of the intestines presented the normal appearanee. On laying open the small intestines the mueous membrane was found free from ulceration, exeept in the lower two feet of the ileum, where it was uleerated in several plaees, as were also the ileo-eæeal and eolie valves; a large uleer was observed in the eæeum, and several uleers at the junetion of eæeum and eolon; but in the eolon itself nothing was presented exeept a few slightly vaseular patehes.

Case 5.—M. K., aged 21, weak, redueed, and anæmie; admitted 2nd July, eomplaining of loss of appetite, debility, thirst; pulse is low and feeble; tongue covered with a white eoating; bowels tolerably regular.

July 4th.—Little ehange is presented: he is still extremely weak and has little appetite.

July 6th.—Is somewhat weaker and is scarcely able to sit up for more than a few minutes at a time; there is very little pyrexia present; appetite is still very indifferent; tongue elammy; towards evening slight heat of skin is observed with some degree of thirst; bowels regular.

July 7th.—Continues extremely low; physical symptoms of a low obscure nature are observed, with dryness of the mouth and tongue; the latter is red

at the edges and tip; bowels are regular; there is no appetite, and little disposition is shown to give expression to wants of any kind.

July 8th.—The symptoms are of a still graver nature; some delirium is observed this morning, and he succeeded in getting out of bed once; tongue is dry and red; pulse small and slow; skin is cool and dry; countenance is depressed, and sclerotic is cloudy.

July 9th.—Continues in a very low, prostrate state; tongue is dry and red at point; countenance pale and sunken; lips somewhat livid; pulse small and slow; skin cool; respiration shallow; appetite indifferent; but the apathy of his state does not allow him to indicate his wants, and he is therefore fed carefully and often; there is no delirium.

July 10th.—Lies in an extremely low, apathetic state this morning; protrudes tongue with difficulty, but it is dry only at the point; the livid sunken aspect of the face is yet observed, and there is slight disposition to stupor; the action of the pulse is very feeble; chest is rather hot though moist; limbs are cool; passed a considerable quantity of feculent matter during the night.

July 11th.—Is extremely feeble and apathetic this morning; tongue protruded with difficulty, and the motion of the organ is tremulous; countenance pale and sunken, with livid tint; bowels moved regularly; dejections being feculent and of proper consistence; urine voided freely.

July 12th.—Is almost incoherent and can scarcely articulate in an intelligible manner; skin warm and moist; pulse of moderate volume still; tongue is dry and protruded with difficulty; *vespere*, about 10 A. M., after having passed a liquid feculent motion (brought off by an enema,) a large quantity of liquid grumous blood was voided, which induced sinking and blanched his features. During the day blood was evacuated to some extent in the same manner, and he now lies in an extremely exhausted state, and though tolerably sensible, he is yet too weak to express his wants.

July 13th.—During the night there were several large evacuations of blood from the bowels and he is now incoherent—unable to articulate, collapsed and of waxy paleness. The pulse has been scarcely perceptible since the first appearance of blood in the evacuations, and pressure over the right iliac region and the hypogastric also was attended with pain, but up to that time all manipulation was borne with ease, and frequent inspection of the dejections discovered nothing abnormal, except that the feculence was passed in small hard masses occasionally.—Died at 10 A.M. this day.

AUTOPSY SIX HOURS AFTER DEATH. *External appearance.*—Considerable emaciation; marks of slight bed sores on each buttock. *Thorax.*—Viscera healthy and of normal appearance. *Abdomen.*—Liver of a pale nutmeg colour, but of ordinary consistence and structure; spleen congested, and slightly enlarged. *Intestines.*—Peritoneal covering pale and free from all traces of inflammatory action—external surface pale, moist, and shining,—the different folds and convolutions being unconnected by any morbid adhesions. Mucous

lining of stomach was of a pale pink colour and healthy in structure, as was also that of duodenum, but a "lumbricus," about 8 inches in length, was found imbedded in some bile. Small intestine was healthy and normal in every respect down to the last three feet of the cæcal extremity; at this part, four or five livid-looking patches, at intervals of several inches from each other, were observed on the external surface of the ileum, one of which gave passage to the contents of the canal. On opening the gut itself, the mucous and muscular coats were found in a state of gangrene, forming dark-grey sloughs at the points where the livid discolorations were seen externally, but there was no attempt at reparation made and no lymph effused. Proceeding downwards and laying open the large intestine, a very sloughy gangrenous condition of the ileo cæcal and colic valves was noticed, and from this point the mucous membrane of the cæcum and colon was covered throughout their entire extent, with a semi-coagulated layer of dark venous blood, though the membrane itself bore no traces of inflammatory action, and was simply tinged of a dark-pink colour (caused apparently by the blood in contact with it), while externally this portion of the intestines presented its natural appearance.

In dissecting the small intestines a curious instance of abnormal conformation was discovered; a portion of the walls at one side being absent, a pouch capable of containing about four ounces of water was thrown off from the canal without affecting the size of its calibre.

Case 6.—J. B., aged 23, admitted on the 25th of August 1859, and died on the 14th September 1859. The symptoms were similar in kind to those recorded in most of the preceding cases, but I am unable to refer to the diary notes in which they are detailed. The following were the post-mortem appearances:—

Autopsy ten hours after death. *Thorax.*—The viscera of this cavity were healthy and presented no abnormal appearance. *Abdomen.*—The liver and all the abdominal viscera were more or less softened. On opening the intestines, large rugged ulcers of the agminated glands were seen on the ileo-cæcal valves, and on the adjacent four feet of the ileum. The mucous membrane of the large intestine bore traces of inflammation but no ulcers were found here.

The clinical and anatomical characters of the disease are illustrated in the cases now detailed, and it must be admitted that they were both of a very unusual description. The particular form of fever, of which these cases are to be considered examples, is the question which now presents itself for solution; but it is one which admits, I think, of a conclusive, if not a very simple, reply. *A priori* it might reasonably enough be supposed

that no difficulty could be experienced in classing them under the head of remittent fever, from the very fact of their occurring in India during the autumn months of the year, as well as from the circumstance that numerous cases of intermittent and remittent fever were recorded in the regiment at the time, in the treatment of which quinine was resorted to with more or less advantage. Moreover it cannot be denied that some of the symptoms were of a kind to lend support to this view, for example, the occasional remissions, particularly in the early stages ; the rapid occurrence so often of adynamia ; the absence of all evidence of contagious properties (which are thought by some to belong to typhoid fever) ; the oppressed and feeble pulse ; the cold sweats alternating with flushes of heat ; the restlessness in one or two cases ; the languor, apathy, and drowsiness in others ; the muscular and nervous depression or exhaustion exhibited in the tremulous twitchings of the hands and the quickly fatal result : but such a diagnosis can scarcely be reconciled with the structural lesions observed after death. The post-mortem appearances, as we have seen, were not those characteristic of remittent fever, they were indeed of quite a different nature, and yet of no mere incidental or trifling kind unconnected with the fatal result, for the morbid changes were not only extensive and manifestly in close relation to the fatal issue of each case, but of a kind which identified the disease so far specially with *typhoid* fever. The lesions in this fever are always observed in the lower third of the ileum, the glands and mucous follicles being the structures engaged, and the morbid changes may be effected either by ulceration or gangrene. In the present instance the process of diseased action in some cases was eminently one of gangrene or sloughing, a part of the mucous membrane and sub-mucous tissue turned brown or black and died, and the line of ulceration was subsequently formed to throw off the dead structures. In others the gangrene or sloughing and ulceration advanced apparently *pari passu*, though probably the former occurred first in point of time to a greater or less extent. Interspersed occasionally, but not always, between the gangrenous patches or sloughing ulcers were enlarged or ulcerated glands and follicles, but no lymph was found effused nor was the

existence of any recuperative efforts attested by the presence of granulations. It was, in fact, a thoroughly destructive process which never failed, especially to attack the ileo-cæcal and colic valves, and was sometimes accompanied by blood degeneration; an aplastic deteriorated condition of the fluids, indicated by the occurrence of hemorrhage, malœna, and the absence of any attempt to repair the diseased structures. Symptoms moreover were not wanting to connect the disease with typhoid fever. The extreme youth of most of the patients, the red tongue, the nature of the dejections, the occasional diarrhœa, the gurgling sound, and slight pain or wincing elicited by pressure over the right iliac region, the impotency of quinine, all afforded strong clinical grounds for assigning the disease in these cases to that form of fever. Nor can the rapid course of the affection be regarded as an objection to this view of its nature, for many cases were presented at this period which advanced very slowly and unsteadily to recovery, in which the symptoms were of a kind very similar to those which proved fatal, and it must be borne in mind that it is only the *fatal* cases of the disease which are recorded *here*. I am aware that Dr. Morehead, an officer of long experience in the Presidency and remarkable for his great accuracy of observation, states—"That typhus, typhoid, and relapsing fevers are unknown in India,"* and doubtless the proof of the identity of typhoid fever would have been much more satisfactory if the specific lenticular rose-colored eruption had been observed, but the disease is new to medical science. The non-discovery of this symptom must not be considered decided evidence of its absence, and I am the less disposed to make much account of the fact that it was not detected, as at the season of the year in which these cases occurred, the patients were covered with prickly heat—lichen tropicus—and it would have been impossible, under the circumstances, even for those well acquainted with the peculiar characters of the eruption to recognise it with certainty.

It might, perhaps, very naturally and justly be supposed that typhoid fever was not in any event an improbable result under conditions such as those which marked the occurrence of these

* Researches on the Diseases of India, vol. 1 page 307, 1856.

cases; but however interesting and important it may be to realise these conditions in their relation to the etiology of the disease after its place in the nosology has been fixed, it will scarcely be conceded that we are at liberty to assume the existence of typhoid fever from a knowledge of these conditions. The conditions may probably be predicated from the disease, but not the disease from the conditions; and the identity of the former can only be established on clinical and anatomical grounds. But assuming that the consideration of these *per se* has raised the proof of its existence up to a high degree of probability, it must be admitted that the recognised presence of those conditions which are known to be invariably associated with typhoid fever gives to the proof greatly additional force.

I may indeed mention that a minute and accurate reference to the small intestines for the anatomical characters of the disease in the cases above detailed was suggested as much by a consideration of the unsatisfactory conditions of the soldiers' life at the time, as by the study of the clinical features of the disease itself. And taking the direct and corroborative proofs of the existence of typhoid fever at what I conceive to be their legitimate value, I am not only of opinion that its identity is fairly established in the history of the cases, but that the disease may have hitherto escaped detection in many instances in this country, simply because the lesions characteristic of it were not sought for nor expected. If this latter supposition be correct (and it will have been observed that the external appearances of the intestine in the autopsy of the cases did not give rise to much cause for suspicion of the mischief which had taken place within), it conveys a suggestion of no small practical importance to efficient sanitary administration. For as conditions of life may prompt us to look for this disease and lead to particular anatomical enquiry in fatal cases, so the detection of such lesions would cause us to infer that the conditions of life were not so satisfactory or unobjectionable as they may have appeared to be, and that immediate amendment was demanded.

The silence hitherto observed regarding this disease in the medical reports and returns from this and other countries is partly explained, no doubt, by the fact already mentioned, that it is one

new to medical science; but it seems pertinent to observe that the two cases of fever attended with ulceration of Peyer's glands which came under the notice of Dr. Hunter, 2nd (Queen's) Regiment, at Deesa in 1841-42* and the two or three with similar lesions which occurred in the experience of Dr. Morehead,† would probably, in the present day, be considered instances of typhoid fever, and I trust the cases now recorded may have the effect of attracting some attention to the subject.

The recognition of specifically distinct forms of disease, the extension and correction of our nosology, are the peculiar province of the clinical observer in civil life, and I believe it is already an established fact that there is an essential difference between typhus and typhoid fever, though the question has not yet been removed from the field of discussion, but it belongs particularly to the medical officers of the public service to collect the scientific data for settling the points yet doubtful in their etiological relations, and fixing their topographical limits. The enquiries of the former tend at present to the conclusion that the difference which has so long existed between English and Continental writers on the subject of fever is explained by the circumstance that different entities were contemplated or referred to. The experience of the latter will, in all likelihood, sanction the belief that typhus chiefly affects cold and temperate climates, and typhoid temperate and warm latitudes, and has a much wider geographical range. But whatever the final results may be in this direction, the subject of typhoid fever is one which must in future commend itself to careful study; and, apart from its histological interest, it is manifest that sanitary science will continue at fault so long as the same group of conditions or causes is held accountable for the appearance of typhus fever in one case and typhoid fever in another. The diseases would appear to be distinct and must acknowledge different conditions in their etiology. These conditions have not yet been accurately defined. The history of typhoid fever given above proves that it is capable of exhibiting itself in one of the hottest countries in the world where typhus has been hitherto unknown. It be-

* Transactions Bombay Medical and Physical Society, 1841-42.

† Researches on the Diseases of India, vol. 1, 1856.

comes therefore, absolutely necessary in this case to note accurately the circumstances under which the disease was observed, in other words the causes of the disease itself; and the facts recorded may not be without value in reference to the large question of the etiology now referred to.

II.—Etiological Conditions.

The 33rd regiment arrived at Deesa in the early part of 1859 from the Deccan; and, on the return of two companies from Nugger Parkur in the middle of May, the head quarters of the regiment—1060 strong—was accommodated in the barracks and patcherries at Deesa; one company, with some invalids, being detached to the sanitarium at Mount Aboo. The married men —55 in number—occupied three of the patcherries, each family being assigned two rooms, which scarcely admitted of any degree of over-crowding. The bandsmen and drummers—45 in number—were provided with accommodation in two detached buildings behind the barracks: 80 or 90 men on an average were inmates of the hospital; and to the barracks proper were allotted about 810 men, 25 of whom were absent on guard duties by day and 50 by night; while to the detachment of married men of the 83rd regiment, which arrived from Nusseerabad before the beginning of the hot season, were handed over the remaining patcherries.

These arrangements continued during the last half of May and whole of June, but early in July a new patcherry was finished and made over to the grenadier company, and the pressure on the barrack space proportionately relieved. On the 1st of August 51 men were transferred to the Horse Artillery at Deesa as volunteers, and the accommodation was rendered thereby more ample, while in the following month the removal of 50 invalids to Aboo and the departure of a wing of the regiment—446 strong—on field service to Dwarka, placed at the disposal of the soldier a very large measure of superficial and cubic space.

It appears that the accommodation of the barracks proper and exclusive of the patcherries is estimated as sufficient for 800 men, and that each soldier on this estimate is provided with

1116 to 1122 cubic feet of air. Now as they were never after the beginning of July occupied by more than that number of men, it will probably be supposed that the affection could not have had any connection with overcrowding as a cause; but I find that the height of the barracks to the cross beams is only about 15 feet, and that the calculation which gives 1116 to 1122 feet to each man estimates the altitude at 19 feet by adding to the height of beam, half the height from beam to roof, namely, 4 feet. The annexed table, however, shows that the superficial area only amounts to 58 or 59 square feet per man, a space which must be considered inadequate in this country, and the more so as it includes the ground taken up by the doors on both sides of these buildings. It is manifest indeed that one-half the height, as far as the soldier is concerned, might have been excluded as an element in the calculation of the cubic space; that the latter, for all practical purposes, would have been estimated correctly on only 9 or 10 feet of the altitude, and does not efficiently represent more than 560 cubic feet.

Taking this view of the matter, it must be admitted that the barracks were not only overcrowded to some extent, but that in reality they are not capable of affording accommodation to the number of men for which they would appear to be officially returned. It is of course impossible in any given instance to limit or define the exact effects which overcrowding produces among a number of other more or less powerful causes of disease, but the etiology of this fever has been prominently connected in my mind with impurity of atmosphere, and I must not omit to notice that there were other conditions present, which, however limited its action, must have served to give it increased influence. For nearly eight months of the year the wind blows almost constantly from the south-west: the barracks are eleven in number and each faces the south-west; but instead of being built in echellon, or arranged checker-wise in lines, they form two lines in such a way that each building in the front line cuts off the wind effectually from a similar one in the second line. An additional barrack (No 11) is moreover thrown out on the extreme right in front, thus completing at this point a block of three buildings one behind the other, the front one of

which alone derives any advantage from the prevailing winds. But not only is the relative position of the different barracks thus objectionable; the lines of barracks are not more than 95 feet apart—a distance wholly inadequate—and between each pair of barracks, in the most objectionable position it was possible to assign to them, were urinaries and cesspools, of which we shall have to speak presently, while the ground in rear of the barracks, and between them and the officers' compounds, though limited in extent, is covered over by the canteen, the quarters occupied by the band, the serjeant-major's house, the regimental cells, the quartermaster serjeant's house, the drummers' quarters, and the cook-houses.

The feeling of pressure and overcrowding in the lines is indeed very disagreeable; nor is this relieved by the character of the buildings themselves, for though the barracks are well ventilated by openings in the roofs and by numerous doors and windows, they stand upon foundations of little elevation and have a somewhat gloomy shed-like appearance.

With regard to the hospital a more favorable account may be presented. It is a well-ventilated building, consisting of two pavilions connected by a capacious archway, and though its accommodation is nominally limited to 60 patients yet no evidence existed of a vitiated condition of the atmosphere. Wounds and ulcers healed rapidly even when occupied by 80 or 90 sick, and the available cubic space was throughout nearly one-half greater than in barracks though calculated on an altitude of only 16½ feet. Further, the duties of the troops were not of a kind to injure their health in any obvious degree, and it will be seen from the number of men on guard at night in proportion to strength, that want of rest or sleep could not have had a prejudicial effect. Thus far, therefore, the overcrowding of barracks and the regimental lines would alone seem to have been connected with the appearance of the disease; but auxiliary to this we have now to note the sanitary condition of the lines as affected by the conservancy system or arrangements which had been for some time in operation, and the baneful results of which it will be more easy to imagine than define.

Arrangements for the disposal of human excreta in military stations, however clumsy and imperfect they may be, often admit

of being worked in a satisfactory manner so long as the troops are limited to a certain number ; but if this number be exceeded to any great extent, they are liable to break down, and thus exhibit their inherent want of adaptability and radical imperfections. This is precisely what occurred in the present instance. The population of the regimental lines could not have fallen short of 1300 people—a number far in excess of that which the conservancy system was capable of accommodating—but the system itself, as we shall now show, was faulty in the extreme, and did not admit of much expansion in its operations.

The two lines of barracks are only about 95 feet apart, and the space between each pair of barracks, small as it is, is occupied by a urinary shed, a cesspool, and an ablution room, the latter constructed in connexion with the back verandah of the barracks in the front line, and having outside it a water pit covered with a trap-door which turned on hinges and was raised by means of an iron ring. The position of all these structures was eminently objectionable in every respect, and especially so between barracks little more than 30 yards apart, but their construction was even still more objectionable. The urinary sheds were divided inside into three compartments by two partition walls, and ledges or troughs of masonry were erected in each of these compartments, about three feet from the floor, to receive the urine which was conveyed into a shallow sewer by which it was carried off to the cesspool. The building materials of the station, both bricks and mortar, are moreover of so indifferent a quality that it is almost impossible to construct really pucka work, and the troughs, instead of forming an inclined plane, broke up and formed basins or pools in which the water lodged. The sewers broke down and crumbled away, and both gave out strong offensive effluvia. The walls of the building became infiltrated with fluid, and the water line was sometimes marked on the walls outside, at a height several feet above the level of the troughs within, while the plaster dropped by degrees off the walls. The ablution rooms were provided with good clean wholesome water from wells within the lines, 80 feet deep, but the receptacle outside about two and-a-half feet deep was constructed in such a way that the water did not reach the level of the drain leading to the cesspool common to it and the urinary

shed till it rose to the depth of a foot; and the drain itself was liable to obstruction from the same cause as the urinary sewer. The result was decomposition and escape of gaseous products through the trap-doors, which seldom fitted accurately after they had been any time in use and were generally cracked by the excessive heat of the sun. The cesspools, one for each of the urinary sheds at a little distance from which they were sunk—15 feet deep—received the drainage from these sheds and the ablution rooms conjointly, and it seems to have been the impression that the water from the latter would neutralize the fluid from the former and by dilution render it innocuous; but it was only necessary to see the cesspools being emptied, to be convinced that the theory was not realised in practice; while the cesspools themselves were subject to the same process of dilapidation as the structures referred to, and constantly demanded repair. It remains only to state that in the working of the arrangements or system now described the urinaries were washed out daily and sprinkled with lime, &c., and the cesspools and water pits cleared of their contents, which were carried to some distance beyond the cantonment limits.

The privies,—two in number,—occupy a position on the right and left of the lines of barracks, and the accommodation which they afforded was quite inadequate; and while the system of cesspools and sewers proved much more offensive than in the instance of the urinaries, the reception of the excreta in baskets, and the consequent diffusion of the liquid parts over the privy floors, rendered them unsatisfactory. It was not unusual indeed for the officers to complain of the overbearing nature of the effluvia from them when the wind blew tolerably steady in the direction of their own lines.

It is generally understood that the soldier is well fed in this country, and it cannot be doubted that he is supplied with a very liberal allowance of animal and vegetable food; but, strange as it may appear, the occurrence of fever of this kind in the regiment has forcibly suggested the use of an unsustaining and defective diet as an accessory cause, and I feel reluctantly compelled to record my opinion to this effect.

Notwithstanding the attention which has been given to this important subject by a beneficent and liberal Government, I am not

satisfied (and it would be a suppression of my sincere convictions to avoid saying so) that the food of the English soldier is of sufficiently good quality during the months of May, June, July, August, and September. It is true that his rations are made up of similar elements—animal and vegetable—and in the same quantity as at any other season of the year, but the meat is grass-fed. In May and June there is little or no grass for cattle to pick up, and they must feed mainly on chopped straw, while in July and August the grass is young and soft, nor does it acquire any fattening properties till the end of September, when the seed has ripened. Further, in August, September, and October, potatoes or sweet potatoes are in many stations, it is to be feared, not regularly available (though there is really no efficient substitute for them in India), and the vegetables chiefly supplied are onions and pumpkins, the latter of which the soldier holds in little estimation and will not always eat, while the former probably possesses feeble nutritive properties. In the summer and autumn months of 1859 the meat was lean, aplastic and innutritious, and no fresh vegetables, except onions and pumpkins, as a very general rule, were issued to the troops; the latter were often thrown aside by the men, and after the commencement of the rains, I have no doubt that the meat was not only innutritious, but that it possessed in fact purgative properties, for at this season of the year, I have since ascertained, that beef-tea, even when carefully made, is often objected to on the part of patients, on the ground that it passes off rapidly, and brings on looseness of the bowels. What is the reason of this result is a question which need not be discussed here. It may be stated that the grass at this season purges the cattle instead of improving their condition; and it is possible the relaxing effect of the meat used as food may be in part derived from this quality of the grass upon which they are fed, while it is obvious that, if the meat itself is not fit for the purpose of complete assimilation, it will act as an irritant to the bowels, and must be expelled. But, whatever explanation is correct as to this point, it will be readly admitted that food of the description here indicated might constitute a predisposing cause (through want of sufficiently nutrient properties) of a disease remarkable for low adynamic symptoms: nor is it difficult to conceive that it might aggravate the intestinal lesions and the

diarrhœa which formed such characteristic features of the affection itself. That my views on this subject were somewhat similar at the time, appears, moreover, from the following extract from my report on the Climate and Topography of Deesa, which has been published in the Statistical, Sanitary, and Medical Report of the Army Medical Department for 1859.* "Although the dietary of the British soldier in this country has frequently engaged the attention of Government during the last few years, and has undergone much improvement by the introduction into it of a pound of fresh vegetables as well as by the allowance of an increased quantity of sugar, yet I regret to have to state that the meat supplied to the troops at this station from the beginning of April† to the end of August was generally of inferior quality, and deficient in sustaining power, owing to the want of grass for cattle, and that the supply of vegetables was, for a great part of the same period, to a great extent limited to onions and pumpkins, the latter of which being considered by the men of little use as an article of food, was sometimes looked upon with aversion, and often left uneaten, either from distaste or from fear of its producing diarrhœa."

"To the defects in the rations here noticed, I attributed in part the feeble exsanguined appearance presented by a large proportion of the men during the last few months, as also in a certain degree the low asthenic symptoms observed in some cases of fever, and I thought it proper to recommend that four ounces of dholl—one of the pulses rich in nitrogen—should be issued twice a week to the European Troops at the station as a substitute for the ration of rice. I may add that this was the only suggestion available under the circumstances, for it was found impossible to supply meat of a better description, and all the exertions of the Brigadier Commanding failed to procure other kinds of vegetables as potatoes, turnips, carrots, sweet potatoes, &c. Happily it was, however, immediately acted upon, and since the 1st of September the soldier has enjoyed and used with advan-

* Page 191.

† The period of the year during which the rations deteriorate in quality is subject to slight change depending on difference of seasons; in one year the meat continues good up to the middle of May, in another it begins to want condition early in April.

tage as pea soup, curry, puddings, &c., this valuable, and too much neglected article of food, which has at once the rare merit of compensating for the nitrogen deficient in the meat, and adding variety to the vegetable element of the diet."

It is probable that the specific cause of the disease will be referred by some to the overcrowding and defective conservancy arrangements now described, whatever secondary share in the results may be attributed to the nature of the food supplied to the troops, and I have therefore dwelt at more than usual length on these unsavoury subjects; but I have now to notice that predisposing cause existed in the composition of the regiment and age of the men, and perhaps also in the climate itself. The regiment was made up of two classes,—men who came out with the corps from the Mauritius (about 700 in number), who had passed a hot season in the country, and men who joined as recruits (350 in number) in October and November 1858 and beginning of 1859, and who had not spent a hot season in India. The men of the latter class were especially obnoxious to fever, and two-thirds of the total deaths from that disease (11 in number) which occured in 1859 were recorded among them, and the average age of the men who thus died was only 20 years and 6 months; moreover we find that during the autumn months when this fever was noticed, the number of admissions from fever among the recruits was nearly equal to that among the old soldiers, though the strength of the latter was to that of the former in the proportion of two to one. The proclivity to contract the disease thus shown by the young men of the corps was doubtless due in part to the fact that they were quite unseasoned in the country; but assuming the disease to be identical with typhoid fever, as observed in other places, it must have acknowledged the same or similar conditions for its cause, and it was only natural to expect that it should, in accordance with its usual habits, select the younger men of the regiment for its victims. Of the influence of climate it is only possible to say that its extreme dryness and absence of sudden atmospheric changes secures for it a marked immunity from dysenteric affections which, under similar conditions of life in other stations, would probably have covered a large share

of the whole amount of morbid action, and thus have served as a mask to this disease, and that enteric lesions were noticed in a few cases unconnected with fever. That the tendency thus shown, however, to structural change in the small intestine cannot be made of much account as indicating a predisposing cause derived from climate is evident from this, that length of residence did not render the occurrence of such cases more frequent, but the contrary; and it will be shown that no instances of this fever were presented in the regiment during the two subsequent years—1860 and 1861.

III.—Removal of Etiological Conditions: Results: Final Conclusions.

The conditions under which the disease took place having now been considered, it becomes a matter of interest to inquire in what particulars these conditions underwent change or improvement, and what difference as expressed in disease attended these altered circumstances. The facts elicited by this inquiry will be held, I think, to justify the tedious elaboration of the foregoing details, for they appear to me to be an eloquent and instructive commentary on these details—their necessary complement; and I am free to own that this paper would not have been written if I did not consider them an indirect proof of the nature of the disease—a final test of the most efficient agencies concerned in its production, and a striking vindication of sanitary science. It is stated in the Transactions of the Medical and Physical Society of Bombay for 1851-52, that fever is not only "the disease *par excellence* of Deesa," but that the mortality in proportion to the number of cases treated is greater than at the Presidency and double that of Poona or Belgaum; that it amounts to 41·89 of the total mortality, and that more deaths occur from it at the station than from pulmonic affections, diarrhœa, dysentery, cholera, and hepatitis added together; and Dr. Hunter, 2nd (Queen's) regiment, noticing the barracks at Deesa in 1841-42 (at which time ten only were built), states that they are well adapted for the accommodation of 800 or 900 men, and observes—"By far the greater proportion of the sickness and mortality has been occasioned by fever and its sequels,

and that chiefly of the gastro-enteric and gastro-hepatic species, or autumnal remittent," and further records the fact that in one fatal case the cæcal valve was thick, fleshy, and ulcerated, and that in another ulcers were observed at the extremity of the ileum. Now, fever was by no means a very fatal disease in the regiment in 1859 even in presence of the conditions above described,* and we believe it will be made to appear from the following statement extremely probable, that fever, however prevalent it may be in the station, would naturally and under favourable circumstances prove a very mild and by no means a fatal disease—that the climate of Deesa, though an exhausting one, would in fact be remarkably exempt from all the ordinary forms of endemic disease so common in India if the sanitary and hygienic conditions of the soldier's life received all the improvements which they admit of. These are conclusions however, which, if clearly proved, must manifestly possess some public importance; nor is it improbable that the facts adduced may admit of more than local application, and I trust therefore I shall be excused for referring to this part of the subject at some length.

It will be collected from the previous remarks that the immediate cause of the overcrowding of the barracks and regimental lines generally was the return of the companies from Nuggur Parkur on the 16th May 1859, and the necessity of providing shelter for the married men, wives and families of the 83rd regiment who arrived from Nusseerabad in the beginning of the hot season. The latter occupied two of the patcherries which would otherwise have afforded ample accommodation to 140 single men, and yet these patcherries were insufficient for their wants; instead however of making over another patcherry for their use, which would only have further increased the pressure on the limited space available to the regiment, two large houses were hired at the public expense, and handed over to the families of the 83rd regiment yet unprovided for—about

* It must not be supposed that these pages have been written to explain or illustrate any unusual mortality in the regiment, for during the nine months of 1859 to which they refer only 25 men died, namely, 21 from endemic disease and 4 from cholera; the mortality of the whole year was, perhaps, rather below than above the average.

12 in number. In the beginning of July the new patcherry was finished and placed at the disposal of the regiment by the Engineer department, but though it was desirable to remove the married men of the 83rd regiment with their families into this building, for whose accommodation houses had been hired, it was a matter of still more urgent necessity to relieve the pressure on the barracks proper, and it was accordingly handed over, as already mentioned, to the men of the Grenadier company. By this step the overcrowding was in part removed; while the movements already mentioned which took place subsequently still further relieved the accommodation. On the 22nd November 1859 the married men of the 83rd and their families left the station *en route* to Belgaum to join that corps, and no overcrowding was at all possible from that date to the present time, for since the return of the wing from Dwarka, the patcherries which were occupied by that detachment have been made available for the accommodation of the companies of the regiment, while time has reduced in some degree the strength of the corps itself. It is only necessary further to state that tents were pitched in front of the barracks to afford some relief at night to that overcrowding which was for a short time unavoidable; that tents were put up in the hospital compound for the use of the convalescents at night; and that efforts were made, though without success, to share with the artillery their barrack accommodation, and to hire additional houses for the families of the 83rd regiment, who occupied the regimental patcherries.

It will be easily conceived that the conservancy conditions we have described must have been the subject of verbal and written representations. On the 21st of February 1859 my predecessor in the regiment—now Inspector General of Hospitals—Dr. Muir, fully explained the radical imperfections of the cesspool and sewage system; proposed that it should be abolished, and that portable tin or iron vessels should be used as substitutes for the baskets, and that their contents should be removed night and morning in covered carts. On the 22nd April—12 days after I joined the regiment—I called attention to the dilapidated condition of the cesspools and the state of the drains leading from the urinaries and ablution rooms, &c., and my suggestions

on this as on all subsequent occasions, whether communicated verbally or officially, were, as far as possible, given prompt effect to. At this time however, and as an effect of the mutiny, the relations of employment and labour were somewhat disturbed. Skilled labour was with difficulty procured in the station, and nearly all the hands which could be obtained were employed on the patcherry, which was hurried on to completion in order to enlarge the accommodation of the regiment. The sanction of the Government, moreover, was necessary to a change of system which involved expense and could not be procured at once; and thus while the cesspools, urinaries, and privies were undergoing monthly and daily repairs, while the greatest efforts were made to keep them in a clear wholesome condition, the first effective relief to their unsatisfactory state was simply the result of the great reduction of strength which took place on the departure of the wing to Dwarka. At a later period however, and shortly after the wing rejoined the regiment (in March 1860), the system again presented many of its former objectionable features, for though 120 to 140 men were now accommodated in the patcherries, it could not expand or work efficiently as the strength increased, and the condition of the privies, &c., was again brought under notice. As a consequence of this representation a Committee was assembled in April 1860 to report on the system, which recommended that the urine troughs of masonry should be pulled down; that the drains from the urinaries to the cesspools should be closed up, and all communication of urinaries with cesspools cut off; that the urine shed should be provided with iron urinal vessels, and that the contents of the latter should be removed daily beyond cantonment limits, &c. These suggestions it was found at the time impossible to carry out; but at a later date the matter was again represented to the authorities, and the recommendations of the Committee assembled on this occasion received prompt attention. The urine troughs were removed; iron urinal vessels were placed in each of the urinary sheds; the cesspools were abolished; pits were sunk outside the ablution rooms in which iron vessels were suspended to receive the waste water. Similar arrangements were made to receive the drainage from the privies, and iron

vessels, in place of the baskets formerly in use, were sanctioned in all the barracks and patcherries. The new system thus adopted has been at work since the 8th of September 1860,* and with the most satisfactory results, nor need any apprehension be felt regarding the future sanitary conditions of the lines *if provision be made for dammering these iron vessels, and a supply of them be kept on hand to replace those which may in time become corroded and leak.*

It was found impossible, as already stated, to improve the quality of the rations or obtain suitable vegetables for the men during the autumn months of 1859, but owing to the representations submitted, and the anxiety and concern shown by the Brigadier Commanding on the subject, it is fair perhaps to presume that the Commissariat Department was better prepared to make adequate provision for the ensuing year; at all events during the last two seasons, potatoes, sweet potatoes, were issued to the troops regularly, except in September and October, when the potatoes having become old and bad, pumpkins, dhol, &c., were supplied as substitutes. Some improvement moreover was effected in the quality of the meat, and I find in my annual report for the year ending 31st December 1860, that the high sanitary and physical condition to which the men had attained is referred in a great measure to the superior quality of the rations as compared with those of the previous year.

Having thus fully examined the conditions under which this fever was observed; explained the measures recommended for their removal and amendment; and stated the particulars in which the suggestions were carried out, we proceed lastly to note the results as expressed in disease. Our attention may be confined chiefly to the months of May, June, July, August and September, for nearly all the mortality from endemic disease occurred in these months, and the fever of this type was not observed at any other period of the year. The facts are few but striking and important.

* It is unsatisfactory to have to note, that in the interval which elapsed between the assembling of the two Committees above referred to cholera appeared in the regiment and carried off 24 men.

In 1859 the average strength of the regiment in May, June, July, August, and September was about 987. Eight men—all single men and residents of the barracks proper—died from fever, in six of whom the autopsy disclosed the peculiar lesions elsewhere described, while a *great many* cases of a severe kind were received under treatment marked by the *uncertain* and *protracted* convalescence so characteristic of typhoid fever. During the same month in 1860 the average strength was about 765, and two men died under the head of fever, one from secondary abscess of the neck exposing the spine and producing fatal exhaustion, the other from dysenteric complication attended with ulceration of large intestines, and there were very few instances of fever accompanied by serious symptoms. Lastly in 1861 the average strength in these months was 870, and no casualty from fever occurred, nor did the disease present itself in any other form than that of the mild recurring intermittent type.

It may be further mentioned—for it seems worthy of some notice—that the number of deaths at Deesa in nine months of 1859 from endemic disease was 21; in twelve months of 1860, 15; and in 13½ months ending 31st December 1861, 1 only, and this the result of diarrhœa of long standing, contracted during the preceding year at Mount Aboo.*

In former days these results would have been referred to difference of season, and the liability to disease incurred by the age, and the recent arrival in the country of the class of men which experienced the highest mortality; but sanitary science is not entirely satisfied by such an explanation. It is doubtless true that the year 1859 was hotter than the two succeeding years; the register of the thermometer kept at Deesa proves this, and it may in other particulars have been a more unhealthy year; but if the nature of the season during these years fairly accounts

* I must not omit to state here that one man who had been suffering at Deesa from chronic catarrh died at Aboo two months after he left Deesa somewhat suddenly, as I understand, and I believe from an attack of hæmoptysis, and that another man who had previously never been in hospital in the country for more than trifling ailments died at Aboo 7 months after he left Deesa from rapid collapse while under treatment for intermittent fever, the cause of which was found in structural lesion or other changes, the result of disease contracted at some former period of life.

for additional sickness and mortality in 1859, it will not explain the unusual structural lesions which formed the specific characters of this disease; and it is a matter of fact that the men of the European artillery who arrived at the station in June 1859 and were provided throughout with ample barrack accommodation, enjoyed nearly as good, if not quite as good, health that year as either of the following years, and presented no examples of this kind of fever. Again, we cannot hesitate to admit that age and length of residence in the country determined, in a greater or less degree, the amount of sickness and mortality in these years; but on the other hand it may be very justly asked why should disease among the young soldiers find its expression in this kind of fever, and has any connexion been observed in other parts of India between length of residence in the country and the occurrence of a disease distinguished by morbid changes of this description. Without ignoring then the effects of age, length of residence in the country, and difference of season which, as regards the two former at least, would probably in any case have been considerable it seems impossible not to admit; 1st,—That these cases were true examples of 'typhoid fever;' 2nd, That the structural changes observed were the result of the special action of the unfavourable vital conditions noticed above, how much soever climate and other causes may have aided or modified their operation; 3rd, That the disappearance of the disease and the subsequent development of a high standard of the health (which has seldom been equalled, perhaps never surpassed, in India) were not the results of favourable season or acclimatization so called, but are mainly to be referred to the improved conditions of life already described; 4th, That the medical history of the regiment during the last three years, so far as it goes, supplies an illustration of sanitary science and one which, perhaps, in the interest of the soldier it might be well not only to remember but to apply.

EUROPEAN REGIMENT BARRACKS.

DATE OF CONSTRUCTION, *15th January* 1858.

Total number of Rooms or Huts 11 ; regulated number of Non-Commissioned Officers and Men 800.

Barrack Rooms or Huts.	Regulated number of men in each room or hut.	Dimensions of room or hut.				Cubic feet per man.	Superficial area in feet per man of floor space.	Height of men's beds above the floor.	Windows.		
		Length.	Breadth.	Height.	Cubic contents in feet.				Number.	Height.	Width.
		feet	feet	feet	feet	feet	feet	feet		feet	feet
1	80	200	23·6	19	89300	1116·25	58·75	1·7	28	5·6	3·6
2	80	200	23·6	19	89300	1116·25	58·75	1·7	28	5·6	3·6
3	80	200	23·6	19	89300	1116·25	58·75	1·7	28	5·6	3·6
4	70	176	23·6	19	78584	1122·63	59·09	1·7	24	5·6	3·6
5	70	176	23·6	19	78584	1122·63	59·09	1·7	24	5·6	3·6
6	70	176	23·6	19	78584	1122·63	59·09	1·7	24	5 6	3·6
7	70	176	23·6	19	78584	1122·63	59 09	1·7	24	5·6	3·6
8	70	176	23·6	19	78584	1122·63	59·09	1·7	24	5·6	3·6
9	70	176	23·6	19	78584	1122·63	59·09	1·7	24	5·6	3·6
10	70	176	23·6	19	78584	1122·63	59·09	1·7	24	5·6	3·6
11	70	176	23·6	19	78584	1122·63	59 09	1·7	24	5·6	3·6
Total..... 11	800	....	....	....	896572	12329·79	648·97	....	276	....	....
Guard Room 1	....	41	20	16·6	13530	....	....	....	....	....	....
Cells..... 12	1	9	9	11	891	891	81	....	....	....	....

ON VARIX LYMPHATICUS: ITS CO-EXISTENCE WITH ELEPHANTIASIS, AND WITH CHYLOUS URINE: TO WHICH ARE ADDED, REMARKS ON THE PATHOLOGY OF THE LAST-NAMED DISEASE.

BY H. VANDYKE CARTER. M.D., Lond., Grant Medical College, Bombay.

Papers read before the Medical and Physical Society, December 1860, and December 1861.

I propose by the term "Varix Lymphaticus" to designate a partially hypertrophied and varicose state of the lymphatic vessels and glands, some instances of which have come before my notice. These cases will first of all be given in detail, with others of Chylous Urine, which I have also had the opportunity of examining: afterwards the local disease will be described, and its connection with chylous urine and elephantiasis demonstrated. Finally, I shall offer other considerations and proofs which seem to establish the accuracy of the view now proposed of the pathology of chylous urine; and if these last should appear to be urged with undue earnestness, a conviction of the interest and importance of the subject must be my excuse.

Description of the Cases.

For the most important of these I am indebted to the practice of the Male Dispensary attached to the Jamsetjee Jejeebhoy Hospital, Bombay; they are three in number and are given in the order in which they were seen; the same order serves also to place them in that mutual relation which best illustrates the object I have in view.

There is first an instance of visible and prominent derangement of the inguinal absorbents and glands, accompanied by the accumulation of chyle, and its occasional discharge from the *cutaneous* surface. The urine is unaffected.

The next is a case in which also an extensive local affection of the lymphatic system, in similar parts, is present, and as well a frequent *external* discharge of chyle. But the *urine*, too, is often chylous ; this symptom alternating with an increase of the local symptoms.

Lastly, without any outward apparent local affection, the patient affords a striking instance of *true chylous urine*, similar in characters to the case just mentioned, and also intermittent.

Case 1.—A Parsee lad, *ætat* 20, attended the Male Dispensary on July 15th, 1859, complaining of fever : resides in Bombay, and has no permanent occupation.

He is of the "lymphatic" temperament ; sluggish in manner ; in good bodily condition. The fever was not urgent, but he informed me of the following peculiarity on his person, viz., that a 'milky' discharge frequently took place from a spot on the right thigh, and on examining the place I found a small, hardly perceptible pimple, four or five inches below Poupart's ligament, and behind the course of the great saphenous vein. An inch below this is a small cicatrix the remains of an abscess (?) which had formed there two years since, and was opened by the knife. The inguinal glands are much enlarged, soft or doughy, not painful, or red. The 'milky' fluid is discharged so copiously that in the course of the day a pint has been collected. A drachm of it put into a test tube coagulates in about five minutes, and a few hours afterwards separates into clot and serum, the latter being milky or opaque : the clot is tolerably firm : at a later period the whole again becomes fluid. There is a faint hardly perceptible odour : reaction slightly alkaline : colour yellowish-white, or rather bluish-white or pearly, but it soon acquires a rather pink tint. As collected in a tumbler, the similarity to rich milk is very striking.

On further examination of the part, it is found that pressure below the discharging orifice does not arrest the flow, or alter its rapidity ; on the contrary, pressure with the finger made just above it speedily causes the discharge to cease : pressure on the spot itself leads to the supposition of there being a small distended sac behind the orifice. Neither the veins nor lymphatics of the leg below seem to be affected ; there is no œdema of the foot, and only a sense of slight weakness in the limb. The appetite is good : diet, as usual : he has spermatorrhœa occasionally.

History.—Six months since the discharge spontaneously began, a pimple appeared, it got scratched, and chyle began to flow : pressure being used this

ceased in a few days, but reappeared at the end of a month; lasted a few days, and again stopped. The present occasion is the third time of occurrence, and before it comes on the glands in the groin become tumid and rather painful; afterwards these symptoms cease.

August 7th.—The discharge came on. Ordered bitter tonic, local applications and pressure.

August 9th.—It ceased. Continue. Iodine paint applied to the inguinal glands caused so much irritation that it could not be continued.

August 28th.—Health improving. Has been taking liq. potassæ.

August 31st.—Accidentally scratched the pimple, and immediately several ounces of lymph oozed away: inguinal glands reduced in size. Continue.

September 28th.—The axillary glands of the left side are inflaming.

October 16th.—An ordinary abscess had formed; it is now healing.

October 20th.—Much improved. Inguinal glands quiescent. Is about to change his residence.

1860, *September 21st.*—The discharge has occurred only once within the year: lately suffered from fever preceded by puffiness and enlargement of the glands, which are also painful.

The chyle is discharged from a fresh spot to the inner side of the former; the opposite limb is becoming affected, but no fluid is yet discharged from it: he is almost crippled by the swelling and uneasiness in the groins. The fever is tertian. Ordered Quinine. The patient has not been seen since. It was ascertained that the urine was unaffected.

Microscopical examination of the discharge.—Two hours after removal, in it were found—a hazy tint: groups of minute granules: red blood-corpuscles, some apparently dividing: oil globules (?) of various sizes: granular corpuscles from a little above the size of the latter up to $\frac{1}{2000}$ in. diameter, the larger ones nucleated as well. See Plate I. Fig. 2.

On one occasion the patient brought to Hospital two tumblers filled with the chyle which he had collected during the night: the flow was continuous and abundant, while it lasted: pressure on the discharging orifice caused a small jet of fluid to squirt out some distance, as before said, the flow seemed to be from above downwards.

No case identical with this has since then been observed, nor am I at present aware of others* on record.

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* The following very interesting instance of what appears to have been a discharge of *lymph* from the cutaneous surface was mentioned by the now President of the Medical and Physical Society, Mr. H. J. Carter, F.R.S., in the discussion which followed the reading of the above case. A middle aged Parsee lady, stout and healthy, had for some years been the subject of a discharge from the right breast, which originally was spontaneous, but subsequently, from a notion that it agreed with her health to do so, she was in the habit of frequently inducing it by gently pricking the skin outside the areola, when the fluid trickled down freely, and in quantity sufficient

Case 2.—A Hindoo, *ætat* 35, drives a hackery and lives in Bombay : he became an out-patient August 23rd, 1859, on account of an affection of the scrotum. The skin of this part is corrugated in a peculiar manner, thickened, and marked with numerous small tubercles, which when punctured freely discharge a chylous fluid : the whole feels elastic and doughy, and the part can be somewhat reduced in size by compression, the tubercles (or varicosities, as they may be called) vary in size from a pin's head to a pea, or even larger, their colour is lighter than usual. The inguinal glands are much enlarged in both groins, soft or doughy, diminishing under slow pressure, but soon regaining their former size when this is suspended.

The "milky" discharge occasionally occurs spontaneously, two months since it first appeared, and since then has intermitted five or six times, lasting each time a few days : at present it has been going on for two days, and he reckons to have lost about one pound of fluid daily. It does not issue from any one spot, but from several, it may be, according to the number of tubercles that are burst.

History.—It is four months since the scrotum began to enlarge : native applications were made use of, and it was only after a time that the peculiar corrugation of the skin appeared. The affection has more than once been mistaken for local suppuration, probably on account of the colour of the discharge. When this ceases the inguinal glands above and below Poupart's ligament, and the lymphatic vessels accompanying the spermatic cord, become much enlarged : at such times too the urine becomes chylous (as well as during the discharge sometimes) and frequently coagulates. Such is his own account. Health indifferent; appetite diminished : there is no other complaint, or apparent disease.

August 24th.—The discharge has ceased—alum and zinc lotion and pressure being made use of. Ordered alkali and tonics.

August 25th.—Chylous urine was brought.

August 28th.—Urine again clear.

Sept. 30th.—There is an abscess in the left groin near the abdominal ring : all the glands are more enlarged than at first : there is no lymph discharge either from the scrotum, or in the urine.

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to fill a tumbler. Mr. Carter witnessed the operation and found the fluid to resemble in appearance ordinary serum, having a large firm transparent clot floating in it. As the practice was beneficial rather than otherwise, he did not consider it necessary to interdict it. The patient had long been a widow, and subsequently the discharge ceased about the same time as the menstrual flux. Many cases are recorded in which a flow of *milk* has occurred from other parts o. the breast than the nipple, especially I think from the neighbourhood of the axilla, but such are not to be confounded with this almost unique case : confirmation of the view now taken of it is to be found in the cases of lymph-urine, one of which will be referred to further on.

Admitted into Hospital April 20th, 1860, the local symptoms being the same: he had slight fever: he remained under my care till June 20th, when he was transferred to the Clinical Ward, after which he again entered an ordinary ward, and in a short time left the Hospital improved in health: he has not been seen since.

The prominent features of this case while under close observation may be summed up in a few words: the tumefaction of the inguinal glands and scrotum appeared to alternate with the appearance of chyle in the urine: this circumstance was sufficiently established. The parts also became tumefied a short time after a full meal (two or three hours) and then again subsided. There did not appear to be any regularity or known cause for the appearance and disappearance of chyle in the urine: thus on May 4th the urine was clear; 5th, it was chylous; 6th, 7th, 8th, again clear; 9th, it became chylous; 10th, 11th, 12th, 13th, again clear; 14th, chylous; 14th (at night), clear again; 15th, onward, it continued for some time to be chylous.

More prolonged observation did not elicit any different facts. The characters of the urine were as follows:—When natural, it was high-coloured, but clear, or very slightly clouded, and unaffected by heat and nitric acid. Tannic acid was not tried. When chylous, its colour was white, reddish-white, or light pink with a subsequent deposit of pink particles (blood, mixed with crystals of phosphates, and granular matter): perfectly opaque. The lighter coloured urine usually became pinkish after short exposure to air. Generally it more or less completely coagulated: the coagula being coloured. The quantity was above the normal standard; it very readily became decomposed. Sp. Gr. 1017. "Under the microscope numerous blood-corpuscles, and granular cells of much larger size than they, were seen; on adding acetic acid, three and sometimes more nuclei became apparent in the latter." —*Clinical Records, J. J. H.*

The fluid which escaped from the scrotum was probably pure chyle: about two drachms were collected in a test-tube immediately afterwards corked up, while flowing for two or three minutes, the fluid assumed a very decided rosy tint, it coagulated in eight or ten minutes, and the clot, formed after an hour or two, changed its colour almost immediately to a blood-red on exposure to air, a scanty milky serum remaining unchanged. Two hours after removal the clot was found to contain a fine molecular medium, granules, red-corpuscles, some granular, some well-formed, some starred: corpuscles rather larger than these, but resembling them, the colour being less decided, and the margins a little irregular; they were almost as numerous as the more perfectly formed (?) or smaller and darker blood-particles; corpuscles often apparently the most numerous about the same size, or rather less, than the last mentioned but varying in size and even in form, being oval, or irregular, and sometimes not larger than a perfect red corpuscle. They present a mulberry appearance, are nearly colourless, and clear. Others resembling the white blood-globules, always few in number. Obscure indications of fibrinous striæ were seen in the clot. See Plate I. Fig. 6.

On another occasion, the chyle coagulated in four or five minutes, and in an hour or two began to separate: eight hours afterwards a small quantity, one-sixth of the whole, of milky serum was given out: the clot was slightly red or pink, the upper thin layer quite blood-red, especially on the side where it had been most exposed to the air; this change in colour took place early and was limited to the exposed surfaces: during the following night, the test-tube being set aside, the clot dissolved, and all the red-corpuscles subsided forming a deep purple sediment, very scanty, as if no more red corpuscles had been formed after the first exposure to air; after a time the property of changing colour seems to be lost.

The change of colour on exposure of this man's urine was striking enough, but far more remarkable in this chylous fluid; it was almost wonderful to see the bright pink colour steal over its surface, the clots formed, in a few minutes were precisely similar in appearance to blood-clots: under the microscope, however, it was not possible to trace the change.

The blood of this patient was ascertained to be normal: its serum being quite clear and bright.

There was generally even when the urine appeared clear, a slight milky oozing from the urethra.

Various methods of treatment were adopted; large doses of gallic acid (3i *ter in die*) had no effect: large doses (3ss—3i) of liq. potassæ and Scott's mercurial plaster to the scrotum appeared to be most beneficial: before leaving the Hospital his health and bodily condition were much improved, and he had then by no means the aspect of a man whose system was being drained of nutriment: the appetite was not voracious: the urine had become normal previously, while the local affection had not changed its character.

Cases resembling the above are rare, but have been seen, except that the urine was not affected:* I have met with an example of the local affection at a very early stage which for convenience may be mentioned now, but will be more fully referred to further on in the description of that disease.

* Trans. Med. and Phys. Soc. of Bombay, Vol. II. New Series, p. 341. Partial Hypertrophy of the scrotum attended with a peculiar eruption and discharge. Reported by Mr. Ardaseer Jamsetjee, G. G. M. C., July 1854. Patient a stout Parsee merchant, *ætat* 50; duration of disease seventeen and a half years: preceded by an injury. There are vesicles of a minute size at the front and upper part of the scrotum, where the integument is rough and thick: from them exudes a white milky fluid sometimes to a large amount: this coagulates and afterwards separates into two parts: there are no corpuscles in it. The discharge is irregular in its appearance, and subsequently the vesicles subside. The general health is good: treatment has little effect: the author supposes the occurrence of this discharge prevents increase of the hypertrophy of the scrotum which might otherwise take place. The character of the 'milky' discharge was not detected.

Case.—*Varicose lymphatics of the scrotum; early stage.*—A Mussulman lascar, *ætat* 25, was admitted into the J. J. Hospital May 9th, 1861, suffering from fever; there is also an enlarged and relaxed state of the skin of the scrotum, which is thrown into coarse, very lax folds, running transversely: the left side is more pendulous than the opposite, and the lower part shows best the corrugated appearance produced by the subjacent dilated vessels: the *septum scroti* is also enlarged. The whole feels doughy and soft. Testes and inguinal glands unaffected: there has never been any exudation from the surface. This state of things is of three months' duration, and arose spontaneously, being accompanied with slight fever. Health and bodily condition good: sluggish habit. The urine was found to be high-coloured, tolerably clear, free from deposit, slightly acid, and it contained no albumen: on another occasion its colour was lighter and slight clouds of mucus were noticed in it. The fever was cured by Quinine, when the size of the scrotum diminished: he has observed that towards evening it becomes increased, lessening in the morning. A spot lighter than the rest was punctured, and immediately a small stream spirted from the pinhole, of a fluid resembling milk in colour and consistence, but having a slight yellow or pinkish tinge which deepens on exposure to air, a test-tube was more than half filled in the course of three or four minutes, and two or three minutes later the whole had "set" firmly. The microscope showed, first, numerous corpuscles chiefly pale-red in colour, regular form, being flattened concave discs, size $\frac{1}{2666}$ to $\frac{1}{4000}$ inch in diameter; numerous pale granular corpuscles, spherical, of regular form and size varying from $\frac{1}{4000}$ to $\frac{1}{2000}$ or even larger. Next, a fine granular medium (molecular base). A portion of the fluid heated in a test-tube became thick, and threw up a yellow scum, the colour of which was removed by æther, the remaining opaque fluid being un-acted on.

On another occasion the fluid obtained from the scrotum was at first more clear, afterwards becoming opalescent, and acquiring a yellowish colour. It may be inferred that this singular discharge was lymph more or less mixed with chyle, it could not be confounded with simple serum, nor would liquor sanguinis have presented the same characters; the local changes in the skin of the scrotum gave the impression of something very different to œdema, or any form of sub-cutaneous effusion.

Case 3.—A Hindoo youth, *ætat* 22, married; a clerk. Two years sick. Lives in Bombay; came to the Dispensary October 21st, 1860: he states that his urine appears to be mixed with milk and blood; that this appearance suddenly supervened about two years since while living in Poona; having risen one morning to make water, a large quantity of milky fluid flowed out, and so alarmed him that he nearly fainted: this discharge continued for three and a half months, suddenly ceased for five months, then came on lasting nine months, again stopped for a time, and has once more recommenced since April last. The urine is copious, frequently passed, and what he brings this morning is of a milk-like colour or rather reddish, there are clots in it of a

pink or even blood-red hue: these clots pass with the urine, and frequently on account of their size, with difficulty. The urine usually coagulates, and very readily decomposes. No abnormal appearance about the genitals, groins, &c. He is a pallid weak lad, and complains of palpitations, rheumatic pains, and diminished appetite. Ordered Calumba c Iron. and salines.

October 24th.—He states the urine which is passed in the morning is opaque and white, while that passed in the after part of the day is reddish coloured, or soon becomes so.

November 16th.—He passed in my presence several ounces (about eight) of urine, the colour of which was at the outset, purple or brick-red, towards the close of micturition it became lighter, or pink: a red clot of some size and irregular form also, the tint of which was at first purple (venous) and on exposure became scarlet (arterial). After standing, when the red particles subside, the opaque milky appearance remains, and on the surface a thin layer of firm white substance resembling fatty matter is formed: the urine soon becomes ammoniacal.

In the intervals when the urine appears to be unaffected, he states that it is rather high-coloured, clear, and less in quantity.

Microscopic examination.—On one occasion numerous corpuscles of the most varied form and different size were seen—some resembled normal red-particles, others like such, only bent up, elongated so as to become pointed, and distaff-shaped, starred and tubercular: they were all clear and of a yellowish hue. Subsequently, I found undoubted chyle corpuscles, with other elements of that fluid, so that the question was settled in my own mind whether chyle of a perfected character is or is not to be found in the so-called chylous urine. Plate I. Fig. 3.

The patient improved under the tonic treatment, and at my suggestion then went away for change of air to the Deccan.

He was very intelligent, and his statements could be relied on: he spontaneously told me that the ingestion of flesh or wheaten bread greatly increased the disease.

I have recently been fortunate enough to meet with two other cases resembling the above: one shows the influence of diet; the other, a *really* chylous state of urine.

Case 4.—A Parsee, *ætat* 31, a cook, lives in Bombay; has been sick four years. He passes urine having the appearance of milk, and containing blood-clots: there is some difficulty of micturition, but no pain in the bladder, &c.; a sense of weakness in the loins and testes. No apparent affection of the genitals, gland in the groins, &c. but has a small hernia on the right side: in fair bodily condition: appetite and digestion good. At one time he suffered from syphilis. The history of the case is as follows: about four years since he was attacked with fever and then, without apparent cause,t he urine almost suddenly became chylous, and continued so for a year. Under treatment he

became perfectly well, and except an occasional appearance of chyle in the urine, remained so till about six months since, when the latter again suddenly became chylous and has continued so ever since. The appearance of the urine varies considerably, at present it mostly coagulates, and the small quantity that remains fluid is of a milky hue: it also contains red-blood clots frequently: the quantity is excessive, and there is a faint odour. If he abstain from food for a day the urine becomes clear and of the ordinary colour, but immediately on resuming his ordinary diet, it acquires the above appearance: after eating (much?) rice and sweetmeats, the symptoms are increased, also after fowl and ghee, it is much less chylous when he takes only tea and bread, and under all circumstances the appearances vary during the day: they are not rendered more marked by exercise, but the chylous condition is solely regulated by diet. These statements were all volunteered by the patient, and it seems to me, are worthy of all the credence one may be inclined to award them.

He was treated with Liq. Potassæ. After discontinuing attendence for a time, he returned with erysipelas of the left arm, and fever; when the latter came on the urine changed its colour suddenly and became reddish, sometimes coagulating and sometimes not. The red colour is deepest in the morning: on one occasion I found the fresh urine to be quite fluid, of a brick-red colour, deepest at the bottom of the bottle (from admixture of blood?), the upper portion had the ordinary colour of urine. He experienced little benefit from treatment, much more from abstinence, and finally resumed his duties.

Microscopic examination of the urine. *November 18th.*—The upper part of the urine was light-brown and opaque; it contained a few red corpuscles, some starred, which formed a dark sediment also: in the latter were found a few granular corpuscles in clusters of four or five, $\frac{1}{2000}$ to $\frac{1}{2666}$ inches in diameter, occasionally nucleated: some resembled white corpuscles very closely: occasionally large clear corpuscles were seen. *November 20th.*—The urine brought was of an opaque reddish tinge, with no deposit, and had entirely coagulated, no serum having separated even at the end of several hours. The night previously he had taken some meat (not being able to resist his appetite) but that day, and before, only tea and bread, during which time the urine was clear and natural: the meal of meat had induced the present state. On examination, the clot was found to have assumed the shape of the bottle (narrow-necked), and though an ammoniacal odour was perceptible, it remained firm, and even then the red tinge increased on exposure to air, after which however the clot very slowly dissolved. Its contents were structureless fibrine—imbedded in which were numerous red blood-particles mostly normal in appearance, others starred and mulberry-like: no other cells were seen, or granules, or masses. *November 22nd.*—Three ounces of high-coloured clouded urine were brought; passed this morning: since the last date he has lived entirely on tea and bread, taken thrice daily, and urine like the present

has been passed for that time: no smell, slightly acid reaction. Sp. Gr. 1020. There was a very distinct precipitate with heat and acid. Heated to precipitate the albumen, and filtered, the clear fluid, on a solution of Tannic acid being added, became very cloudy and finally deposited a distinct precipitate. At the same time I took some fresh healthy urine and added Tannic acid, which caused only a very slight opalescence. Equal parts of ether added to this man's urine was followed by a separation, above; the former, almost clear, but of gelatinous consistence;* while the lower part consisted of the urine apparently unaffected: where the ethereal solution was in contact with the urine a thin opaque layer was observed in it. Microscope—nil.

It is admitted that the microscopical evidence of the presence of chyle in this case was weak; the urine appeared rather to contain *Lymph*, and Tannic acid showed the presence of immature albumen.

Case 5.—I had only the opportunity of examining the urine of this patient, but was kindly furnished with notes by her medical attendant, Mr. Merwanjee Sorabjee, an esteemed Graduate of the College. He says, "The patient is a young Parsee female, of about 17 years of age, married, but has no children; her husband is absent in China. She came under my care October 23rd, 1861, being ill since the day previously: complained of severe pain in the loins, extending down to the groin, and of lancinating pains in the pubic region, lasting more or less during the day and night. The urine was milky in appearance and contained some small coagula. Demulcents and anodynes were given with temporary relief, afterwards Balsam of Copaiva with Liq. Potassæ and Morphia; and the next day the urine became free of chyle, clear and high coloured; it continued so for a day or two when irritability of the stomach came on, the Balsam was omitted and diuretics with anodynes were given. The urine again became milky, and the excruciating pains continued: warm baths and mustard applications to the loins and epigastrium, produced some relief: and the Balsam was resumed the next day: the urine again became clear and continued so for a day or two, when I was again obliged to discontinue the Copaiva in consequence of gastric disturbance. Infus. Lini and Liq. Pot. with Hyoscyamus were given without any effect. Day by day the milkiness increased, and the urine mostly coagulated. Clots forming in the bladder, caused severe pain and straining during micturition. In the mean time the patient had become distinctly hysterical and complained of pain all over the abdomen, increased on pressure and so severe that she cried out day and night. Chloroform inhalation, with chloric ether and morphia, soothed her for a time. After consultation with Dr. Ballingall, gallic acid was tried without any effect: previously nitro-muriatic acid had failed after two days'

* It is stated by authors that the addition of ether to immature chyle causes the coagulation of the dissolved albumen: possibly, therefore, this gelatinization of the ether was owing to the presence of imperfectly elaborated albumen.

trial. On two or three occasions the urine was observed lighter in colour after noon meals. The pain subsided, but afterwards returned; the urine remained the same; and the patient left off medical treatment for a time." Afterwards it is stated, "December 4th.—The patient is in much the same state, except that the hysteria has disappeared.... Since yesterday morning she has been unwell, and the urine then passed is said to have been as milky as before, containing also many coagula: that passed in the afternoon, *i. e.* four hours, after the noon meal, was observed by me to be clearer and less milky, although after keeping it coagulated. She took dinner at 8 P. M., and passed urine in the night which was not kept, in the morning it was seen by me to be strongly milk-like and coagulated, and so it has been on two other occasions during the day."

On three occasions urine was forwarded to me for examination, the first (November 12th) was very opaque and of a white colour: it contained a large white clot. *Microscopic examination of the serum.* 1.—Distinct molecular base and molecular movement: oxalate of lime crystals ($\frac{1}{3300}$ to $\frac{1}{8000}$ in. diameter): many vibriones. 2.—Red blood-particles recognised by their colour, clearness, and regular form, but the size was sometimes $\frac{1}{4000}$: a few $\frac{1}{6000}$ only, resembled the others. 3.—Granular corpuscles with irregular margins, $\frac{1}{4000}$ or more, on the addition of acetic acid small compound nuclei were seen. 4.—Large granular corpuscles $\frac{1}{2666}$ inches with granular contents or even a bright distinct nucleus, better seen on the addition of acetic acid: others of about the same size were less granular, and several somewhat smaller were only clouded, and of regular (rather flattened?) form. Some of these larger corpuscles were observed in the midst of clusters of the smaller sized referred to under the 3rd head. 5.—A few large granular spherical masses, and some large flat epithelial scales.

Second specimen (*November 20th*). Almost precisely the same contents; the clot which had formed was of a reddish colour. In the serum were found red blood-particles of small size but well formed—very numerous small granular corpuscles, the granules in which sometimes forming a kind of nucleus were well seen on the addition of acetic acid: these bodies much resembled pus or mucus, but were apparently rather smaller and more regular than either, and contained granules or nuclei of larger size. Larger corpuscles distinctly nucleated (one or more being present). Fewer large globules with a full-sized nucleus, and occasionally on the addition of acetic acid, a few large granules in them. The molecular base was distinct, and ran into granules and drops when strong acetic acid was added.

Third specimen (*December 5th*). The urine presented a well-marked opalescence, yellowish and jelly-like; it had a strong odour of "mete," the seeds of an umbelliferous plant used in native condiments and not unlike fennel: there were no coagula: a slight reddish deposit. Sp. Gr. 1015. Reaction

slightly acid. In this deposit were numerous small reddish fibrinous laminæ, resembling (so to speak) the growing parts in the ovum of the Fowl. The mieroscope deteeted numerous red blood-partieles to all appearanee normal. A few larger granular cells with nuelei, also the same granular eorpuseles as before, about the size of red blood. Large jointed vibriones and epithelial seales : the molecular base was indistinct. (For illustration of the above remarks see Pl. I. Fig. 4. ; also Kölliker, Manual, &e. p. 514).

There cannot, I think, be any doubt concerning the microscopical characters of the three specimens now described : some care is required to see the corpuscles, &c. : I found it best to allow several drops of the lower stratum of fluid to partly evaporate on a glass slide, and then to examine first without the thin glass, and afterwards place this gently on the slightly thickened fluid.*

Instances of the ordinary form of chylous urine are not very uncommon in Bombay : a patient so affected was till recently attending the Male Dispensary.

A Hindoo, *ætat* 20 : had been sick for six years. There was fever at first and then the urine suddenly beeame of a milk eolour, white elots being intermixed : there are frequent intervals in which the urine is normal in appearance, and it suddenly and without evident eause assumes the milky, clotted aspect. Neither urine nor clots are ever any other colour than white. The health is but little affeeted : he has no other complaint. Little benefit resulted from treatment, many plans of which were long tried : large doses of Liq. Potassæ and occasional courses of Iron seemed most benefieial. The urine was not examined with the microscope.

Having already indicated the relation which the cases above detailed seem to bear to each other, I have only now to refer to the subsequent remarks on the peculiar structural lesion which is probably common to them and all similar cases ; but before describing the local affection, which merits separate notice, it may be as well to subjoin in this place, the notes of a striking instance of the disease recorded in the Edinburgh Medical and Surgical Journal for January 1860, p. 690 : it occurred at the Missionary Hospital in Canton.

* On the occasion referred to in a previous note, Mr. Carter mentioned another case which probably resembled some of those above described. He was called to see a patient, a young Parsee, in a state of hopeless exhaustion, produced by the copious discharge in the urine of chyle and blood clot, who died shortly afterwards. It was said that one of his female ancestors had exhibited a similar state of the urine.

The man is a farmer, aged about 28, whose *scrotum* is hypertrophied and pendulous, and covered with a large number of follicles, exuding when ruptured a quantity of a milky fluid. The consistency of the fluid varies with circumstances, being thick and milky after exertion and long detention in the scrotum, and thin and watery after long oozing. The quantity excreted is increased by exercise, the standing posture, and whatever causes expansion and relaxation of the scrotum, while it is diminished by the recumbent posture, by quiet and rest, also by the application of cold to the scrotum. Independently of exercise, the scrotum, testicles, and follicles are subject to periodic enlargement at night, preceded and accompanied by heat and a doughy sensation. When the fluid commences to flow, it does not cease till all is exhausted : there is a peculiar feel of the part. No spermatorrhœa or affection of the sexual powers. The disease is of two years' standing. The discharge occurs once or oftener a mouth, and the quantity varies from a cupful to a bowlful : he feels weak after it ceases. Knows no one else so affected. The tubercles in the scrotum did not appear till a year after the first commencement of the disease.

An operation was performed on this patient, the skin in front of the scrotum being removed and the edges drawn together over the testicles. The wound healed, but a month after the operation a few follicles began to appear in the parts left behind and even in the cicatrix ; the former symptoms were returning, and it was evident that a radical cure could be effected only by removing the entire scrotum. The patient went away.

A second case is referred to in the same Report with similar but more aggravated symptoms : the disease had lasted three years, and the whole of the scrotum as well as the skin of the perineum was affected.

No surmise is made in this well-detailed case as to the nature of the abundant milky discharge, which in my opinion was most probably *chyle*.

On Varicose Lymphatics (Varix Lymphaticus).

These vessels are *primâ facie* equally liable to permanent dilatation as the veins : which would also be accompanied with inefficiency of their valves, so that regurgitation of their contents would occur.

As regards the lymphatic glands placed in the course of the dilated vessels, it is probable they too would become enlarged, either from mechanical causes, or from the same predisposition of habit or structure operating on them also. It is certainly possible that the glands being first affected might, by obstruction to circulation, induce a varicose state of the lymphatic trunks below, but we do not find such to be the case in actual experience (*e. g.* in scrofulous or syphilitic enlargement), hence

it is more likely that the glands in such cases as I have now narrated, become implicated, if at all, secondarily: and this view is substantiated by the history of Case no. 2, and absence of glandular enlargement in the one following it, and that occurring at Canton.

This much is certain, that the external disease is only part of a deeper-seated one implicating the lymphatics placed along the iliac vessels and abdominal aorta as far as the root of the mesentery: for admitting the exudation in these cases to be chyle, of which there is no reasonable doubt, it is evident that its source must be from above, that is from near the *receptaculum chyli*, whence it regurgitates downwards through the enlarged vessels, whose valves offer no obstruction to the backward flow, to the lowest or pendant parts. In this manner I explain the state of things in the Parsee youth whose case is first detailed: the chyle found its way down as far as the groin or even into the thigh, there accumulating, and when let out by an accidental opening producing the copious discharge. In the other instances it reached the scrotum and there escaped.

Supposing now the dilated vessels had opened, instead of on the skin, on the mucous membrane of the urinary tract, a large quantity—how large these cases inform us—of chyle would be mixed with the *urine*, giving rise to a strictly *chylous* state: this probably did occur in the Hindoo, Case no. 2, p. 174.

And since in the other cases narrated there was no external swelling, &c., I infer that only the deep-seated lymphatics in the situations named above were affected, but more will be said on this subject when the pathology of ordinary chylous-urine disease is discussed.

When the parts in the groin are the seat of "varix lymphaticus," the inguinal *lymphatic glands* may be hypertrophied, puffy, soft, or doughy, free from pain or redness, and what is particularly to be noted, liable to change in dimensions, diminishing under steady pressure, and increasing after meals (when absorption of chyle is going on), or exercise, or the standing posture, when they may become full, firm, or tender: the distension may be so great as to lead to rupture on the cutaneous surface. It is not irrelevant to inquire if their function at this time be not also increased.

The *scrotum*, when affected, is hypertrophied, pendulous, or distended, soft or doughy, and free from pain: the natural transverse wrinkles are more marked, the surface appearing corrugated: afterwards it is covered below and in front with numerous small soft tubercles or vesicles which are not isolated, but are clearly owing to distension of subjacent lymphatic trunks: at the same time large and somewhat tortuous vessels may be detected taking the course of the spermatic cord, along which the ordinary lymphatics pass. The septum scroti, or one side only, may be first affected. The same peculiarity as regards change of dimensions is to be noted here as in the *glands*: but these latter are not necessarily implicated in the scrotal disease. The diagnostic character, however, is that when a vesicle is punctured a fluid more or less opalescent or even milky exudes, having all the appearances of lymph or chyle; when the latter is present the distended vesicles have a whitish tinge in the dark skin: after the escape of a certain quantity of fluid the size of the scrotum, and other symptoms of local distension, partly subside. The testes are not necessarily implicated.

Varix lymphaticus occurs in other regions of the body besides the groin and perineum:* see the note, *ante* p. 173.

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* Independent of its connection with chylous urine, which is nowhere noticed, some striking illustrations of this dilated condition of the lymphatics may be found in works on Pathology. For example, Morgagni (Cook's Transl. vol. 2, p. 239) mentions a case of old pericarditis and dropsy in which "the lymphatics about the division of the renal vessels were so extremely distended that three or four were individually equal to a goose-quill in size." Hasse (Pathol. Anatomy p. 9.) observes, "the instances are frequent in which the calibre of lymphatic vessels is preternaturally large. Nor are we able to account for this phenomenon unless when mechanical causes have obviously prevailed, &c. Sömmering notices numerous cases of dilated lymphatics." The dilatation being partial may produce a resemblance to hydatids. "I have myself met with a remarkable specimen of hydatid distension of the lymphatics in the groin of a man who had died of pneumonia." Cruikshank alludes to and delineates a case where the lymphatics of the groin had reached a size sufficient to permit the introduction of a straw by which air was blown into them: a corresponding enlargement of these vessels was traced through the abdomen into the thorax: the iliac glands had entirely disappeared, being replaced by the lymphatic vessels. But the most remarkable instance on record occurred to Amussat, and is referred to by Casswell (Pathol. Anat. under the head of Hypertrophy) who has also given a drawing which shows an extraordinary state of parts. The patient was twenty-six years of age; for years there had been a

On the connection of Varix Lymphaticus with Elephantiasis.

The observations I have to offer on this subject are chiefly applicable to Elephantiasis as attacking the scrotum, but the same remarks will probably apply to that form of the disease which occurs in the extremities, and is generally admitted to be of the same nature as the scrotal affection.

As is well known, Elephantiasis (Arabum) has been attributed to inflammation of the lymphatic vessels and glands, but this opinion, long prevalent, has not, that I am aware of, received any direct confirmation of late. It is not my intention to enter at present into the consideration of the pathology of Elephantiasis, but simply to offer some facts which appear to indicate a close connection between a *varicose* (not necessarily an inflamed) state of the lymphatic system, and an œdematous (elephantoid) enlargement of the parts which happen to be affected. Several instances of 'varix lymphaticus' are narrated

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swelling in each groin so much like double hernia, that he had long worn a truss: eventually he died with symptoms of strangulation. After death "the only remarkable circumstance observed was enormous dilatation of the lymphatics from both groins upwards, including the thoracic duct:" "all the lymphatics of the pelvic and lumbar regions" were found in the same state. Hasse also refers to the same case and adds "the tumours were found to contain pus." The inguinal glands had disappeared, being resolved into these swellings: no impediment to the circulation in the vessels could be detected. It will strike the most cursory observer that in many particulars the case first described in this paper (that of the young Parsee) much resembles this one. The inference I drew as to the condition of the deep-seated vessels is also confirmed: but as to the nature of the swellings in the groins, which I suppose to be enlarged glands, there may be some doubt, seeing that in several of these cases the glands have become converted into mere distended passages. Further, the surmise that the so-called "pus" mentioned by Hasse as filling the enlarged vessels, was in reality nothing but "chyle" is very probable: it is mere speculation to add that the sudden death of this patient may have been owing to the rapid entrance into the blood of a quantity of this perhaps altered fluid, by rupture, as the symptoms were not unlike those of pyœmia.

Lastly, I may mention that Cruvelhier has often seen the lymphatics of the groin and uterus large enough to admit the thumb: and that dilatation of the thoracic duct is by no means uncommon, as well as of the *recaptaculum chyli*. It is well worthy of remark that the vessels of the groin and lumber regions are noted by authors as those most frequently the seat of distension, and it need not be further pointed out how this fact bears on the pathology of chylous urine as suggested in these pages.

in this paper, and such appear to be by no means unfrequent in this country, where also Elephantiasis commonly prevails. The *scrotum* is a frequent seat of both affections. Accessions of fever at more or less regular intervals (sometimes distinguished as 'elephantoid fever') seem to be equally common, and at these times the local symptoms, in both cases, undergo an exacerbation: inflammation and abscess may follow in both. These common features are well worthy of notice. In Elephantiasis, other symptoms showing implication of the lymphatic system are also superinduced when the fever sets in, such as "tenderness and hardness in the course of the lymphatics leading to the nearest glands," and in the more "advanced stages suppuration*.....of the enlarged lymphatic glands in the proximity: sometimes a milky-like fluid oozes in considerable quantity from the hypertrophied papillæ (?) of the skin, and generally coagulates spontaneously into a gelatinous mass:" in both diseases there is frequent recurrence and subsidence of the symptoms. (See Morehead, Researches, &c. Vol. II. p. 677.)

More definite evidence of this connection is afforded by such cases as the following. In the first and second, the fluid which exuded bore all the marks, I think, of pure lymph, and in the last, the presumption was entirely of the same kind. I ought to add, however, that I once unsuccessfully endeavoured to find lymphatics in a fully developed elephantoid tumour which was amputated at the J. J. Hospital, but the circumstances, as I now judge, were not favourable to their injection.

Case 1.—An adult Parsee, a shopkeeper in Bombay, attended the Male Dispensary, in the beginning of February 1862. The scrotum was as large as a pomegranate; the skin thickened, wrinkled, and pendulous, this change being confined to the front, lower, and back parts; and, in addition, numerous minute vesicles, not unlike herpes, may be seen scattered all over the surface; they contain a clear fluid, except a few of the larger which are opaque. The testes are found above and behind the swelling, and seem unaffected, as also the cord, inguinal glands, &c. Health good. He states that the disease began two years since: until lately he suffered from fever (coming on once or twice a month), preceded by swelling and tenderness of the scrotal tumour; frequently a copious discharge of a "sticky" fluid would then take place from

* Suppuration of the glands, both near and at a distance, was observed in cases 1 and 2.

the latter, soaking his dress, &c. and afterwards these symptoms would subside.

I collected about half a drachm of a light straw-coloured, slightly opalescent fluid by puncturing one of the vesicles, in a couple of minutes; after two or three it began to set. More than two hours subsequently a small quantity of serum had separated from the firm clot: this was carefully examined under the microscope, and numerous corpuscles were visible, the majority of which were spherical, delicately granular, with no indication of a cell wall: size $\frac{1}{7000}$ to $\frac{1}{3000}$ inch: some a little larger, and a few $\frac{1}{2666}$ to $\frac{1}{2000}$, with a bright, ill-defined nucleus: besides these were a very few red blood-corpuscles, some starred, and several oil globules of minute size.

On the addition of acetic acid the small granular corpuscles speedily showed a trace of a cell wall which required a high power to be seen, and appeared to rapidly dissolve in the acid: the nucleus shrank and became more defined: the larger corpuscles also presented a well-defined bright nucleus, always single. Simple water was then added to some fresh serum; the same appearances of nuclei were seen, and the very delicate cell wall remained longer visible.

The clot was firm, opalescent and white (the serum being slightly tinged yellow), but when broken up it became quite opaque, just as the clear *cornea* does when the parallelism of its layers is destroyed: it contained myriads of the above granular cells, imbedded in a finely granular, slightly striated, and tough material.

In my own mind I am convinced that these delicate corpuscles are the same as Kölliker (Manual, &c. p. 514) describes as occurring in Lymph and Chyle: he now views them as really cellular, and not free nuclei; but it requires careful watching to see the cell wall, when re-agents are added. Plate 1. fig 7.

Case 2.—A Borah, *ætat* 40, a native of Guzerat, lately attended the Male Dispensary on account of a swelling in the left leg and foot; this had the general appearance of simple œdema, but the skin of the leg was unusually pale and shining, and the orifices of the hair follicles were very distinct; the swelling was not excessive and included only the dorsum of the foot, it extended upwards nearly to the knee; though rather hard, it readily pitted on firm pressure, particularly on the inner side of the leg and dorsum of the foot. The opposite limb is quite unaffected. On further inquiry the scrotum is also found to be enlarged; the penis dragged down and nearly hidden in thickened skin, similar in aspect to that of ordinary *Elephantiasis scroti*. The lower part and front of the scrotum is remarkably corrugated, and studded with numerous very small soft tubercles or vesicles: the *septum scroti* has the same appearance and is especially prominent, and a broad wrinkled line runs upwards from near it along the retracted and swollen prepuce. These parts are of a tint darker than that of ordinary skin, and limited by a defined line from the thickened and tumefied integument covering the spermatic cord, &c.;

the hairs are few. There is a decided enlargement, of a doughy kind, in each groin, without the glands there being themselves prominent. Some of the little tubercles on the scrotum are very prominent, on even pedunculated, and occasionally a spontaneous discharge occurs, at one or more points, of a clear fluid, very "sticky" or gum-like, and often considerable in quantity. On forcibly squeezing the parts, the size of the whole may be considerably diminished.

The patient is in fair health, and only complains of the leg and foot being the seat of pricking or shooting sensations, and from the swelling walking is irksome. He contracted syphilis many years since, and had then an abscess in the right groin: he took mercury, and there is not now any trace of infection. The urine is said to be natural in appearance and quantity, as it has always been: and the ingestion of food has no influence on the swelling. History from the first—five or six years ago the scortum began to enlarge, and he had fever; native applications were used without benefit, and subsequently the size became considerable; an abscess seems to have slowly formed, the scar of which remains. The fever was considerable: afterwards the enlargement of the scrotum partly subsided, and became stationary, remaining much as it is now without any noticeable change, he states. There seems once to have been some sore on the right leg with swelling, but about three months since the opposite one began to be affected, a spot or pimple above the inner ankle (a trace now remains) from which a quantity of clear redish fluid escaped; when this discharge ceased, the whole leg and foot began to swell: at that time he had strong fever, preceded by vomiting, &c. The swelling increases after standing or walking, and partly subsides during the night: as before said, there is considerable enlargement in the corresponding groin. The patient denies the existence of an hereditary tendency to Elephantiasis.

Microscopic examination of the exudation from the scrotum.—On puncturing one of the vesicles, a clear fluid began to trickle down at once, which was colourless, or afterwards, slightly straw-coloured; it coagulates in a few minutes. No molecular base, granules or granular masses to be seen. It contains very numerous pale granular corpuscles, the majority of which are of uniform size $\left(\frac{1}{4000}-\frac{1}{6000}\text{ inch in diameter}\right)$; a few similar ones of larger size $\left(+\frac{1}{3000}\text{ inch}\right)$ may occasionally be seen, and, very scantily, some red blood-corpuscles (accidental?), which are easily distinguished by their colour, double contour, flattened shape, and their size, which is about intermediate that of the two kinds of granular corpuscles. No nuclei were to be seen in the smaller and more numerous particles, and only occasionally in the larger, and then only one: the addition of water did not render the nuclei much more evident, but acetic acid at once produced a characteristic appearance, such as is described in the case just detailed. It is needless to enter into further particulars now, but it may be mentioned that on partially

drying up, the larger granular cells seemed to put forth processes strongly resembling those figured by authors as characteristic of lymph-corpuscles (see plate I. fig. 1), and almost reminding one of the simple *amœba* cell : occasionally it seemed to me that the nucleus participated in this change.

Of the identity of these corpuscles with those of chyle and lymph, there can be no question. Whatever may be thought of the descriptions given in the previous pages of the various corpuscles found in the urine, which must necessarily undergo a change in that fluid, rendering their identification less satisfactory (and my illustrations partly illustrate this), no second opinion can exist regarding the character of the fluid directly drawn from the dilated lymphatics : hence the character of the local disease is fully established, and the present instance is peculiarly interesting, inasmuch as it furnishes an example of the actual co-existence of 'varix lymphaticus' and Elephantiasis ; a conjunction, too, that shows the former to stand in relation to the latter, as cause to effect : this is the result I have arrived at while investigating the case.

Case 3.—Last October I examined a scrotal tumour immediately after removal from an adult Parsee, at the J. J. Hospital. Its size was equal to a cocoanut and it was of four years' standing. Only the lower parts of the scrotum were affected, below the level of the testes : here the skin was thickened, finely wrinkled or tuberculated, in a transverse direction, and thrown into larger transverse folds : the *septum scroti* was very distinct : texture almost semi-transparent. A few small round tubercles were seen scattered about, somewhat larger than a pin's head, and not unlike the vesicles of *herpes* in appearance. The hair was plentiful ; the openings of the follicles not particularly large, the tumour having contracted.

I punctured one of these vesicles and examined its contents microscopically ; in it were pale granules having rather irregular margins, some appeared nucleated, size $\frac{1}{2666}$ inch : many red blood corpuscles (accidental ?) some starred, and curled up : several smaller red particles (?) : many granular corpuscles about $\frac{1}{4000}$ inch : no molecular base : a few oil globules, and epithelial scales from the skin. (See plate I. fig. 8.)

Such are the facts in my possession, they will serve to illustrate the heading of this division of our subject ; and although from their consideration it may not be positively asserted that Elephantiasis owes its origin to an affection of the lymphatic system, yet that this disease is *accompanied* by such an affection seems undeniable. The most convincing of all proofs would be the injection of the lymphatics, but opportunities of examining, in the dead body, an elephantoid tumour *in situ*, can hardly be anticipated from their extreme rarity.

On the Pathology of the disease characterised by a Chylous condition of the Urine.

The *physical properties* of the urine now referred to are well known to most observers. Prout* mentions the white appearance and the spontaneous coagulation as characteristic: but the latter feature is by no means invariable, and the colour may be tinted red.

As to the *microscopic characters* of chylous urine, there is no great uniformity amongst observers, but the points of difference have mostly turned upon the presence or absence of oil granules and oil globules: no writer has hitherto recognised chyle-corpuscles in the urine, though Rayer, and Beale more recently, mentions the occurrence of small granular cells.†

With reference to its *chemical composition*, the presence of albumen, more or less perfect, and of fat, is universally acknowledged: and also the occasional occurrence of fibrine, and less frequently of red blood-corpuscles. The salts and extractives have not been sufficiently discriminated from those of pure urine to allow of inference being made. The only complete analyses of chylous urine I have had access to, are those of B. Jones, and Beale (Archives, Vol. I. p. 10): there is a qualitative analysis by Dr. Mayer of the Madras Medical Service reported in the Madras Medical Reports, 1855, p. 104, which however is not available for my present purpose, as it has particular reference to the existence of caseine (which was not found) in the urine.

Prevailing views as to the nature of the disease.—Those of Prout are generally adopted, wholly or in part: he says, "The chyle from some derangement in the processes of assimilation is not raised to the blood-standard, and consequently being unfit

* He first gave the name "chylous" to this kind of urine, afterwards using the term "chylo-serous" in accordance with changes in his views of its pathology, considering that it approaches to "serous" urine or albumin-uria.

† Quite recently (Med. Times and Gaz., Oct. 26, 1861, p. 442) it is reported that Dr. Waters of Liverpool has found corpuscles precisely resembling those of chyle in the urine.

for the future purposes of the economy is, agreeably to a law of the economy, ejected through the kidnies: but these organs, instead of disorganizing or reducing it to the crystalline state as usual (that is, instead of changing the chyle into the lithate of ammonia), permit it to pass through them unchanged" (On Stomach and Renal Disease, ed. 5, p. 116). Dr. Prout was well aware that the adoption of his views necessitated two suppositions, viz. mal-assimilation and co-existing renal derangement—neither of which is capable of being substantiated: what, too, we may ask is the nature of a local derangement lasting for years, can it be regarded as "purely functional?"

Elliotson, B. Jones, and G. Bird would regard the affection as one of the kidnies, without any giving a substantial ground for this opinion. Beale, amongst others, considers this view as untenable, and supposes rather that the chylous state of the urine is "intimately connected with the absorption of chyle," but how does not appear. In my opinion it is connected with an abnormal *distribution* of the chyle, which becomes admixed with the urine in a direct manner, and not through abnormal excretion as Prout supposes, or from its absorption as Beale intimates.

Circumstances not explicable on Prout's hypothesis, &c. 1.—The frequent sudden appearance, and the capricious (it would so seem) cessation and renewal of the symptoms. 2.—The absence of a chylous condition of the blood in these cases: the admitted absence of organic disease of the kidnies: and the absence of such constitutional disturbance as would necessarily accompany prolonged derangement of the assimilative processes and renal functions. 3.—The long duration of the symptoms. To these we may add the endemic character of the disease, and its frequent complication with hœmaturia.

Circumstances satisfactorily accounted for in the supposition of direct admixture of chyle, of various degrees of maturation, with the urine. 1.—The above-named peculiarities in the origin and course of the disease. We may suppose that distension of the delicate lymphatics and lacteals in the lumbar region, is at length followed by exudation at one or more points of their contents, or

rupture taking place,* a fistulous orifice is formed which gives free exit to the chyle or lymph, at times of recurring distension: or an abnormal reservoir—"receptaculum"—may exist, which periodically discharges its contents into the pelvis of the kidney, into the ureter, or bladder. The cases above related are evidence that such a condition of the lymphatic vessels and glands does occur, with reversal of the flow of chyle; and in case No. 2, with it there was connected a chylous state of the urine (p. 177). 2. The absence of organic changes in the blood † or kidnies is satisfactorily explained, since on this hypothesis, their implication is no necessary accompaniment of the symptoms: also the absence of marked constitutional derangement beyond what is occasionally witnessed, that is, a debilitated state dependant on the altered destination of nutritive materials.

The frequent complication with Hœmaturia (see Rayer, l. c.) is explicable in the assumption of a weakened condition of the walls of the blood-vessels, such as probably would accompany a similar condition of the absorbents: in both cases being indicative of structural idiosyncrasy, sometimes seen, *e. g.* in natives of India. ‡

The endemic prevalence of chylous urine in Mauritius, Bourbon, Brazil, West Indies, Cuba, and perhaps India, may be accounted for on the same supposition. There are grounds also for supposing this idiosyncrasy to be hereditary.

But the following features of chylous-urine disease find here a full explanation, viz. the connection of the symptoms with

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* In the absence of anatomical demonstration of this, it may be remembered that the origin of the lymphatics from the mucous membranes generally is by a network so superficial that the mercury used in injection appears almost uncovered. Cruvelhier, Vol. II. p. 813. (Tweedie's Library.)

† The milky tint which normal blood-serum has occasionally exhibited is, in my opinion, connected with quite a different state of things, although some modern authors would place the phenomena in one category (see Parkes on the Urine): the connection of the two has not been shown, so far as I am aware.

‡ In the dissecting room of the Bombay Medical College I have been struck with the great attenuation of the coats of the vessels, even of considerable size: arteries appearing little less transparent than veins. Yet it must be said that hœmorrhages are not frequent in natives: perhaps the generally depressed state of the circulation in them may account for this.

digestion and the absorption of chyle,* the stimulus of exertion, &c. and next, the variations observed in the character of the urine in different cases.

It is clear that the rapid formation of chyle in the first case, or its quicker circulation resulting from whatever stimulates the general circulation of fluids in the body, will be accompanied by an increase of the local changes—increased distension of the varicose lymphatics, or overflow of any part dilated into a kind of receptacle, and the consequent transit of chyle into the urinary passages. The case of other fluxes is in this respect very similar.

Next as regards the different states of the urine, it will be readily admitted that if the abnormal communication between the absorbents and the urinary tract occur at various points in the course of the former, the "chylous" condition will also vary accordingly. I have made a table showing the state of the chyle at three several points in its course, and annexed some references to published cases of the disease, which will serve as illustrations of this remark. The principal results are, that when chyle of great opacity and free of fibrine, causing the urine to resemble milk, is poured out, it is presumable that the admixture takes place above or below, at the root of the mesentery, and probably from lacteals that have not yet passed through the whole series of mesenteric glands. I would however observe, that a small quantity of fibrine may be present and yet not be apparent, and that immature fibrine cannot be detected even by analysis: so that non-coagulability of the urine does not necessarily indicate total absence of fibrine: and it is not likely that the lacteals near their commencement could communicate with

* I am aware that Dr. B. Jones is of opinion "that the most important changes in the urine take place independently of the influence of digestion" (Phil. Trans. 1850, p. 651), and that in confirmation some cases concur with his one, as Dr. G. Bird's, and even one of my own: but I submit that other instances indubitably show the connection of the two phenomena, and agree with other proofs in support of the hypothesis now advanced: and that until it is shown that the interval occupied by the transit of chyle along the lacteals, in these cases, is incompatible with that which occurs between complete digestion and exacerbation of the local symptoms: or that in other respects the phenomena are irreconcilable, I am warranted in making use of the clear and positive facts exhibited by cases 1, 2, and 3. The opinion of Prout should be recollected, that "after a meal the characters of chylous urine are more fully developed."

any portion of the urinary passages, though not quite impossible. On the other hand, when the urine rapidly solidifies and takes on a reddish tint when exposed to air, or contains white or red clots at the time of expulsion, we may suppose that the communication is with the larger lacteals or the thoracic duct itself, opening possibly on the mucous surface of the pelvis of the kidney, or commencement of the ureter. (See Appendix B).

Again when the urine contains only Albumen and Fibrine, and little or no fatty matters, as seems occasionally to occur, we are warranted in supposing that at this time, it is not chyle, but *lymph* (carried by the lacteals in the intervals of digestion) that has become mixed with it. Case No. 4 in this article, and that so elaborately investigated by Dr. B. Jones will serve to illustrate my meaning. In the instances where the urine at all times has this clear appearance, the explanation is this, that ordinary lymphatics communicate with the urinary passages. (See the table under the head of "Lymph-urine.")

The varying condition of the urine in any single case is readily explicable on the assumption that chyle, differing in quality, or mixed with lymph, is then poured out.

If in these observations other occasional states have been overlooked, they should not be regarded as hostile to the view now proposed, since on the one hand, to them also would many of the above remarks apply, and on the other, our actual knowledge is but limited of the composition of chyle under ordinary circumstances, in man, no analysis of the unmixed fluid having yet been made: the contents of the thoracic duct have certainly been analysed, but the composition of this mixture of lymph and chyle, will of course vary much more than that of chyle alone.

As the matter stands, I submit, that a more ready and satisfactory explanation is furnished by my hypothesis than by those generally received. Not that the idea is altogether novel, though based on direct observation, for Rayer* long since noticed the

* "En examinant cette urine chyleuse comparativement avec une mélange de l'urine saine et du chyle rosé recueillé dans le reservoir de Pecquet chez un cheval, l'analogie de ces deux liqueurs, de l'urine chyleuse artificielle et de l'urine chyleuse de l'homme, m'aparu des plus frappantes.....Quant aux urines albumino-graisseuses elles ressemblaient une urine dans laquelle on aurait ajouté les élémens organiques du chyle moins ses globules." Mal. des Reins. t. iii. p. 421.

similarity of chylous urine to an artificial mixture of urine and chyle, and as regards certain microscopic characters, Beale has lately remarked the same.

I will only mention, lastly, that two other occasional features of the disease are satisfactorily accounted for on this view, viz. the increased quantity of chylous urine passed, and its greater tendency to decomposition. It is observed of chyle that its albuminous constituents readily decompose (Carpenter).

Proofs of the accuracy of this view.—For the sake of clearness I have reserved until now those facts, which most of all are conclusive in their character: they may be arranged under two heads, 1 chemical, 2 microscopic.

1. The two chief abnormal ingredients of chylous urine are Fatty matters and Albumen. With regard to Fibrine, it is occasionally absent, and frequently in small amount: in chyle itself, the quantity varies, *e. g.* Dr. Rees found 3·7 per 1000 parts of "fibrinous matter," others as Hasse, have found much less. The circumstances in which its presence in chylous urine may be overlooked have been already referred to. Of the Salts and Extractives nothing can yet be determined; confining therefore our observations to the two first mentioned ingredients, it is obvious that whilst they may exist in chylous urine in varying quantity, yet that under all circumstances the *relative proportion* of each will be the same, seeing that neither previously exists in the urine.

Now we do find on comparing known and trustworthy analyses of chyle and chylous urine, that in the latter, Albumen and Fat exist in the same proportion as in the former. I will offer two examples. *First*, Rees' analysis of *chyle* gives the following figures :—

	p. 1000	
Albuminous matters	35·16	Proportion
Fatty matters	36 01	nearly equal.

The chyle of the Cat was found by Hasse to contain as follows :—

	p. 1000	
* Albumen	33·25	Proportion
Fat	32·07	nearly equal.

* His numbers are albumen *and extractives* 48·9 per 1000: in order to obtain the quantity of Albumen alone, I have deducted the extractives, taking the numbers

So that in well-elaborated chyle these ingredients are found in nearly equal quantities: in urine, mixed with chyle, they should also be present in the same proportions. Such is sometimes the case.

Dr. Beale's analysis of a specimen of *chylous urine* is as follows:—

	p. 1000	
Albumen	13.0	Proportion
Fatty matters	13.9	nearly equal.

These numbers seem to me to correspond far too closely to be the result of mere coincidence: admitting this, the inference is unavoidable that chylous urine is strictly a compound of the two liquids. As to the *amount* of each, the figures in Beale's case indicate a dilution of chyle with urine to the extent of upwards of two-thirds of the whole.

Second. Considering how much our food varies as to quality and quantity, it may be conceived that the chyle has also no uniform composition. When present in urine the same fact is observed.

Hasse analysed the *chyle* of the Horse, and found only one-half the quantity of fatty matters compared with albumen.

	p. 1000	
Albumen	31·0	Proportions nearly
Fat	15·0	2 albumen, 1 Fat.

Dr. B. Jones furnishes two analyses of the urine of a patient whose case was made an object of study: they are the following:—

	Chylous urine p. 1000		
	1	2	
Albumen	14·03	13·95	Proportions nearly
Fat	8·37	7·46	2 albumen, 1 Fat.

(For the details of these analyses see the Appendix A.)

Rees gives for them, viz. 15·65, there remains the quantity indicated above: in most respects these two analyses closely resemble each other, the fibrine showing the widest difference. The rich quality of the chyle in Rees' specimen may be accounted for by the copious and nitrogenous food the animal partook of a few hours before death.

In this instance, as in the first, the correspondence is striking enough to warrant attention. No other fluid besides chyle presents such a composition, and I may also observe that no ingredients of chylous urine have been pointed out which are not present either in urine or in chyle.

I believe the above facts are the only ones available at present for the purpose of comparison, and I confess that the results now given when first detected were a cause of some satisfaction, which has not been diminished by closer investigation of the whole subject : I have examined as far as possible all the recorded cases of the disease to be found in our journals and standard authors, and do not find any uniform series of phenomena, the occurrence of which would disprove or falsify the view I now put forth and hold as correct.

2. *Microscopic evidence.*—It may first be remarked under this head that the presence of a 'molecular base' in chylous urine has already been established ; also the occasional presence of minute oil-globules, such as occur in chyle.

Granular corpuscles have also been noticed, as before stated, but in no instance have true *chyle corpuscles* been described or figured. The presence of these would necessarily settle the question as to the presence of chyle. In case No. 3, I have ascertained their undoubted presence in considerable numbers. They were of various form and size—minute granules—round granular corpuscles, the walls of which were not visible : some of elongated form—others of larger size, with a cell wall, starred, or furnished with the characteristic processes—others still larger, globular and slightly granular : the dimensions of all varied from $\frac{1}{6660}$, $\frac{1}{3200}$ to $\frac{1}{2500}$ inch. A few red corpuscles were seen, and cells larger than these with irregular margins but clear. I have examined several other specimens of chylous urine with equally satisfactory results (see the cases and plate II.) : so that we have positive evidence of the admixture of a fluid with the urine dissimilar to blood, and similar to chyle, the latter fact being confirmed by chemical analysis. With regard to the negative results of former observers, a remark of Kölliker's may be quoted —" a considerable variation exists, and a milk-white chyle is not always rich in corpuscles."

No inconsiderable item in these evidences is, however, derived from the determination of a molecular base, which Priestly and Beale have remarked: in order to examine for corpuscles I have found it convenient to allow a few drops of the lower layers of the urine to partly thicken by evaporation on a slide, and then examine without and with the thin glass.

By way of showing that the microscopic variations in chylous urine are probably explicable on the supposition that chyle became mixed with the urine at different points in different cases, it may be desirable to inquire further into the state of this fluid in health. Kölliker states that in it are present immeasurably fine granules (including those of the molecular base): nuclei, or cells, of $\frac{1}{10000}$ to $\frac{1}{5000}$: chyle corpuscles $\frac{1}{4000}$ to $\frac{1}{1800}$: and red corpuscles. In the larger mesenteric trunks, the chyle corpuscles first appear and are then imperfectly formed, size $\frac{1}{5000}$ to $\frac{1}{3300}$ inch: nearer the thoracic duct they become more numerous, and very large: in the last-named locality these disappear, and others like white blood globules are found: so that we have some means of diagnosing the locality whence chyle found in urine has been derived.

For instance, the presence under the microscope of numerous free nuclei (small cells) would indicate early admixture, such it is possible might occur at the upper or lower end of the mesentery, where the lacteals are necessarily very short and might even, near their commencement, be at no great distance from the pelvis of the kidney or ureter: the larger nucleated cells would indicate the source to be from those lymphatic vessels in the mesentery, by far the greater number, which have passed through the series of mesenteric glands: the contents of the thoracic duct have few of these larger cells, but perfect chyle corpuscles are now seen.

There is some variety as regards their nuclei whether single or multiple, and in the cases I have given we may see examples of this.

With reference to that variety of urine, which I propose to name Lymph-Urine, it is only necessary to observe that in it the corpuscles will resemble those of chyle: it has besides

its own peculiar appearance and chemical characteristics, which I need not here enlarge on. This form generally alternates with the true chylous state. (See Appendix B.)

In ending these remarks I would remind those readers who have followed me thus far, in order to give them due force, it should be recollected that at present the pathology of chylous-urine disease is impenetrably obscure—that there is all but anatomical demonstration of the accuracy of the hypothesis now advanced—that full inquiry into the varying characters of normal chyle leads to a satisfactory explanation of the variations of chylous urine—that many clinical features of the disease are hereby alone explained, and that in favour of this new view is the strongest evidence, chemical and microscopic, while *per contra* is none of anything like equal force.

Conclusion.—It is to be regretted that the substantiation of these views does not, at first sight, directly lead to a more successful mode of treating cases of chylous urine than experience has hitherto attained. To reach by internal remedies a local alteration of structure, is in many cases beyond our power, except through means of the system at large. Several medicines adapted so to operate, will at once suggest themselves, the mineral tonics and astringents appearing preferable. The regulation of diet, exercise, &c. should be attended to, and concurrent symptoms relieved. It is worthy of remark, that a tight belt worn round the waist has been known to afford relief, probably by acting mechanically upon the parts in front of the spinal column.

As to the treatment of the scrotal affection, many internal remedies were used with but little effect, nor had astringent lotions or pressure by strapping much influence: it will be recollected that in the case above recited, which occurred at Canton, an operation was performed, a great part of the diseased skin being removed; no cure, however, followed, the disease speedily returned, as might be anticipated from the fact that the scrotal affection is only part of a deep-seated and probably extensive enlargement of the lumbar and iliac lymphatics.

APPENDIX A.

Chemical Analyses of Chyle and Chylous Urine.

First example. Albuminous and Fatty matters present in about equal proportions.

Chyle.			Chylous Urine.	
	Donkey. Dr. O. Rees.	Cat. Hasse.	Analysis by Beale.	
Water	902·37	905·07	Water	947·04
Fibrine	3·70	1·03	Urea	7·73
Albumen	35·16	*33·25	*Albumen*	13·00
Fat	36·01	32·07	*Fatty matters*	13·09
Extractives	15·65	15·65	Extractives, &c. ..	11·66
Salts	7·11	11·04	Salts	6·31

Second example. Proportion of Fatty matters about one-half that of Albumen.

Chyle.		Chylous Urine.		
	Horse. Hasse.	Analyses by Bence Jones (same case).		
Water	935·00	Water	955·58	943·13
Fibrine	·75	Urea	13·26	24·06
Albumen	31·00	*Albumen*	14·03	13·95
Fat	15·00	*Fat*	8·37	7·46
Extractives	6·25	Loss	·75	·60
Salts	8·00	Salts	8·01	10·80

* See the note, page 196, for the manner in which these numbers were obtained.

APPENDIX B.

Cases of Chylous Urine arranged in Physiological Series.

First Series.—Chyle from the afferent lacteals: fatty matter is abundant, albumen plentiful: coagulable matter or fibrine generally absent. Molecular base: numerous oil-globules: numerous free nuclei (small cells) measuring $\frac{1}{9000}$ to $\frac{1}{4500}$ inch in diameter.

Examples of recorded cases in which it may be supposed that this imperfectly elaborated chyle is mixed with the urine: I have however previously noticed that such instances must be regarded as of doubtful occurrence, probably most belonging to the second series. Rayer (l. c. p. 395, 403, here the blood was also affected): Beale's case: G. Bird's (Urinary Deposits, p. 390, 394): Bramwell's case. (Ed. Med. Jour. 1858, p. 714.)

Second Series.—Chyle from the mesentery as far as the vertebral column. Fatty matters diminished: albumen abundant: fibrine exists in varying amount, and has a tendency to putrify: coagulation occurs, but varying in completeness; the clot contains chyle corpuscles covered with a delicate film of oil: they are present also in the serum: the clot has a tendency to become deliquescent. Free nuclei few. Chyle corpuscles are present, size $\frac{1}{3787}$ to $\frac{1}{1653}$ in.: occasionally brown granular cells $\frac{1}{2300}$ — $\frac{1}{1800}$ in. The chyle has a pale reddish yellow tint.

Examples of cases in which chyle of this stage was mixed with urine. Rayer (l. c. p. 388). Elliotson (Med. Times and Gaz. 1857, p. 288). Prout (l. c.). Pearse (l. c.). Morehead (Clin. Res. Vol. VII. p. 290): some of my own.

Third Series.—Chyle from the Receptaculum Chyli and Thoracic duct. Albumen, and fatty matters particularly, diminished: fibrine abundant, coagulation quick and complete: no corpuscles in the clot: chyle corpuscles fully formed, size $\frac{1}{4500}$ or larger with several nuclei. Incipient red corpuscles? a decided red tinge on exposure to air. After coagulation, fat floats on the serum.

Examples in which perfect chyle (mixed with lymph) was poured into the urine. Rayer (l. c. p. 390, 427). Priestly (Med. Times and Gaz. 1857, p. 382). Elliotson (l. c. p. 288). Bence Jones (Phil. Trans. 1850, p. 651): own cases.

Fourth Series.—Lymph-Urine. Coagulation more or less perfect, may be absent: little or no opulescence: probably few corpuscles. Albumen may be present, in the form of albumenoid matter, and detectible by Tannic acid: or of the ordinary form.

Examples.—Case of B. Jones referred to by Thudichum: and others: one of mine (?) Goodeve's case of chylous urine (Trans. Med. and Phys. Soc. of Calcutta, vol. 8, p. cccxxxvii.), "an aged female, whose urine even when not chylous was occasionally loaded with a transparent jelly, which floating in it, was not easily distinguished from the fluid itself, until the contents of the receiving vessel were poured into another pan, when it became evident that the excretion was almost entirely composed of solid matter. There was not the slightest tendency to dropsy in this case: the disease had lasted six months, and had all the features of ordinary chylous urine excepting the above: she was much relieved by treatment, and had been in the habit of eating all sorts of messes and large portions of animal food to support her strength, as she believed." Alkalies, and rigid diet, with diuretics, were the means used in cure. The urine was at rare intervals natural in appearance.

APPENDIX C.

Physiological remarks on Cases 1 *and* 2.—Such favourable opportunity of examining chyle as these afforded, if not unique, must be rare indeed, hence it is to be regretted that they did not occur to a more competent observer. My remarks must be confined to the quantity of chyle discharged, and its rapid change of colour. The few observations already given in the account of the cases may be of interest. Upwards of 16 ozs. of rich chyle have been discharged from the surface in 24 hours, and I collected several ounces in less than half an hour, in both cases: the young Parsee once brought about 20 ozs. collected partly in the morning and partly over night, besides what must have escaped during sleep: hence it would seem that the ordinary estimates of the quantity of chyle formed daily are not greatly in excess. In these cases was no unusual circumstance that could lead to increased formation of chyle: the appetite was not increased: and the loss even of a large quantity did not lead to emaciation. As to the change of colour it was most striking: in case 2 it was very rapid, occurring even while the chyle trickled down from the scrotum, but I think when first escaped the colour was still white: in case 1, however, the change could be readily watched because it was gradual: under the microscope I failed to see a change of tint in the corpuscles. Sharpey (Quain's Anatomy, ed. 6, vol i. p. lx.) states "there is reason to believe that a red tint in the chyle is sometimes occasioned by the development of colouring matter in its own corpuscles, and independently of any admixture from without." The latter part of the quotation is fully confirmed by this case: and I should be inclined to attribute the change to oxidation of the Fe O of which Dr. Rees found a considerable quantity in the albumen (partly corpuscles?) of the rich chyle which he examined; a process which it seems likely may take place without direct exposure to the atmosphere.

Description of the Figures in Plate I.

Fig. 1.—Elements of the chyle. *a.* small cells (so-called *nuclei*), the larger granular and indistinctly nucleated. *b.* two large cells with nuclei. *c.* stellate lymph-corpuscles (Kölliker).

Fig. 2.—Chyle from the thigh. *a.* red blood-corpuscles, some apparently dividing. *b.* granular cells. *c.* larger nucleated cells. (*Vide* p. 172).

Fig. 3.—Chyle from the urine. *a.* altered red blood-corpuscles. *b.* small granular cells. *c.* larger ditto. one stellate. (*Vide* p. 177).

Fig. 4.—Chyle from the urine. *a.* red blood-corpuscles. *b.* small cells, having a distinct nucleus, better seen when acetic acid is added. *c.* larger cells of a similar kind. *d.* others still larger with a distinct nucleus. *e.* octohedral crystals of oxalate of lime. (*Vide* p. 180).

Fig 5.—Chyle from the urine. *a.* blood-corpuscles. *b.* large granular cells. *c.* others still larger, one nucleated. (*Vide* p. 178).

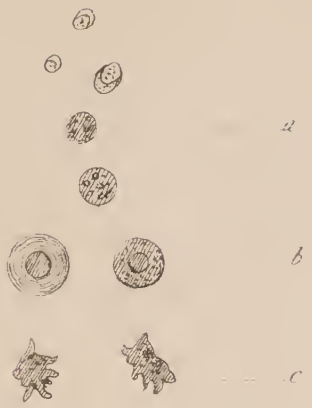
Fig. 6.—Chyle from the scrotum. *a.* red blood-corpuscles of various sizes, &c. *b.* mulberry-like corpuscles. *c.* granular ditto. These were found in the clot, unfortunately the entire fluid was not examined. (*Vide* p. 175).

Fig. 7.—Lymph from the scrotum. *a.* oil globules. *b.* blood-corpuscles. *c.* small granular cells, to some of which acetic acid has been added, and water. *d.* larger granular cells, to one of which water has been added. *e.* a still larger nucleated granular cell. (*Vide* p. 188).

Fig. 8.—Lymph from the scrotum. *a.* blood-corpuscles of various forms. *b.* granular cells. *c.* larger granular nucleated cells. (*Vide* p. 190).

These figures are all drawn to a common scale.

Fig 1



From Hellriegel

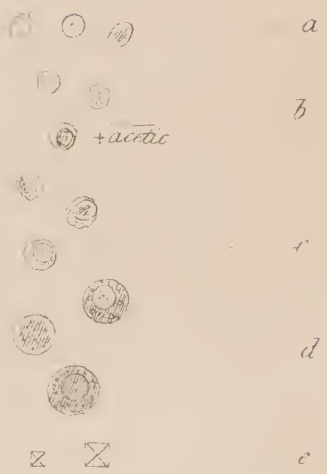
Fig 2.

Case N° 1.

Fig 3.

Case N° 3

Fig. 4



Case N° 5.

Fig. 5

Case N° 4

Fig. 6

Fig. 7

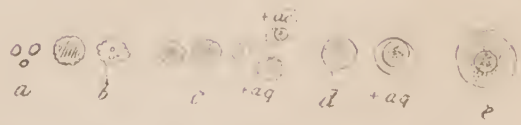
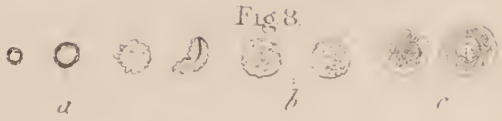
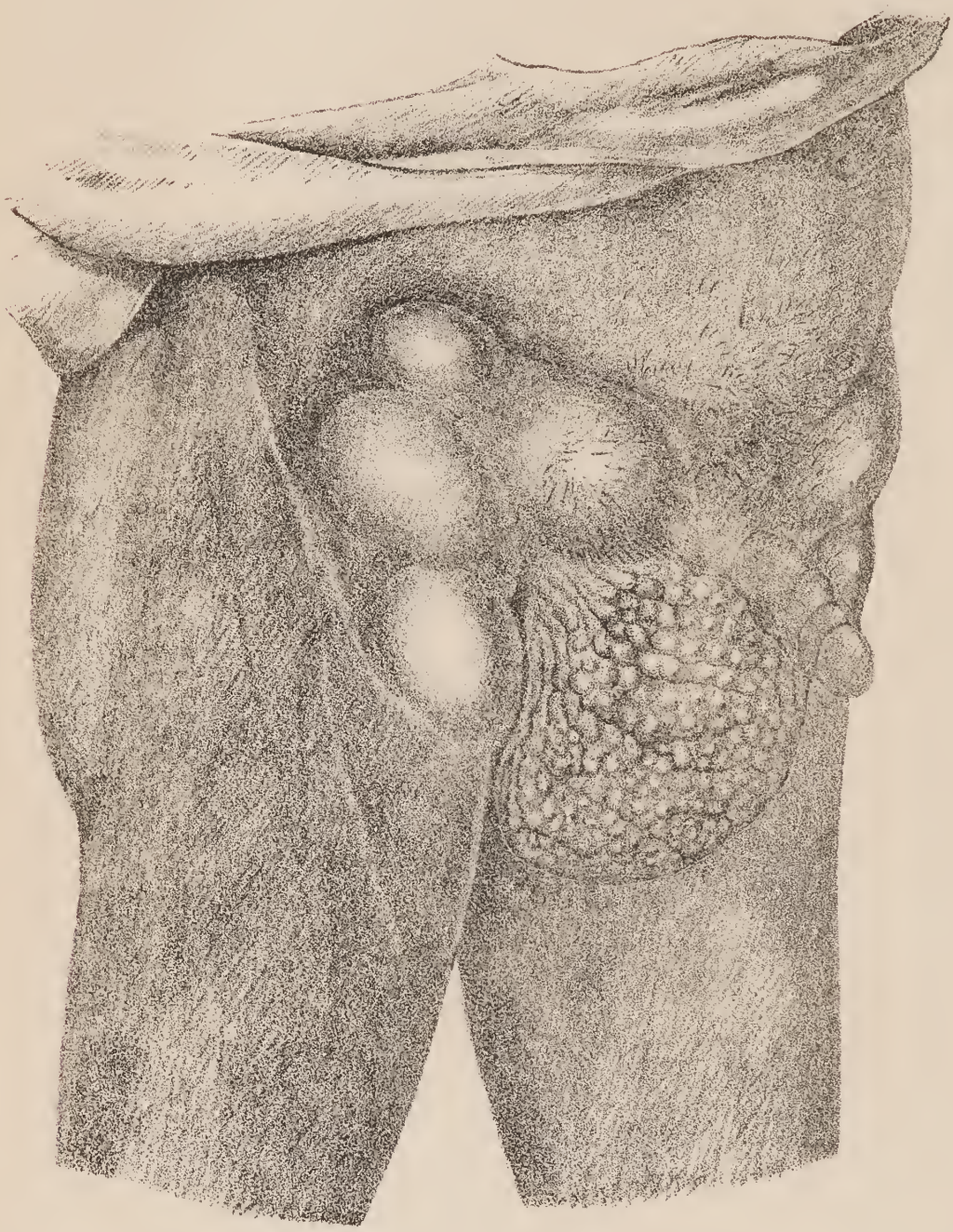


Fig 8.





VARICOSE LYMPHATICS

H.V.C. del

B. E. S. Press.

Plate II.

This figure represents the state of parts in the patient whose case is described at page 174.

The *scrotum* is much enlarged; its front, sides, and lower are seen to be studded with small soft tubercles or vesicles, each of which is filled with a chylous fluid, Dilated and tortuous *lymphatic trunks* passing upwards in the course of the spermatic cord to the groin, are indicated; there the *inguinal glands* are seen to be greatly enlarged.

In this instance the urine was chylous, and had there been no peculiar external appearances, the case would have been regarded as one of ordinary chylous urine. In reality, it differed from such, only from the circumstance that the varicose condition of the lymphatics (which, it is argued, is common to all cases of that disease) was developed in so marked a manner, extending to the groins and scrotum, as to become apparent to the eye.

ON 'MYCETOMA,'* OR THE FUNGUS-DISEASE OF INDIA: INCLUDING NOTES OF RECENT CASES AND NEW OBSERVATIONS ON THE STRUCTURE, &c. OF THE ENTOPHYTIC GROWTH.

BY H. VANDYKE CARTER., M.D., Bombay Medical College.

Presented.

For the sake of convenience and distinction, the term 'Mycetoma' may be used when referring to this peculiar form of swelling. I purposely refrain from naming the Fungus itself of either variety of Mycetoma, considering with Mr. Berkeley (see his letter, p. 208) that it would be at least premature to do so, until more is known of the mode of development and growth in either case.

Since the publication of an article in the last number of the Transactions (see Vol. VI. New Series, p. 104), as opportunities occurred I have continued to direct my attention to this disease: a copy of the paper referred to and some specimens were forwarded to the Rev. Mr. Berkeley, perhaps the most competent mycologist in England: his reply is given in next page. Two cases have occurred at the J. J. Hospital, Bombay, both of the first variety; in one, the foot was amputated and carefully examined immediately after the operation: no new features were detected, but satisfactory confirmation of my former researches was elicited. The other case besides being a typical specimen, was interesting as coming from a new locality—the north-eastern shores of the Persian Gulf. From Kutch we have two cases with notes by Mr. S. Hemraz, and three others seen in Kurrachee by Mr. B. Rustomjee will be referred to further on:

* From μύκης, ητος—*fungus*: the termination is like that of such words as lipoma, enchondroma, &c. the names of various kinds of tumours or swellings.

several instances have now been noticed in the Bengal Presidency, &c. (see Appendix A).

The results of prolonged investigation will be embodied in a few remarks, illustrated by a plate: they concern the structure of the smaller particles, first variety, and new facts touching the development, &c. of the second variety. In Appendix B is a notice of a fungus parasitic on specimens of Mycetoma, itself of some interest.

Letter from Mr. Berkeley.

King's Cliffe, Wansford, July 10th 1861.

My Dear Sir,—I am very much obliged to you for your interesting letter, pamphlet, and specimens. I have carefully examined the latter and see nothing which you have not already detected. Indeed I cannot verify the moniliform structure of the brown part in No. 1, which seems to me rather a conglomeration of irregular cells. Different parts however of the same specimen, especially when fresh, would most probably give cells in a greater or less degree of approximation. Springing out of the brown mass I find oidioid threads, and towards the base slimy granulated threads attenuated upwards. Nothing can be more interesting than the case, but I feel glad that the fungus is published without a name. I believe all these animal fungi are modifications of one common mould, and if so the assigning them especial names, draws off attention from the important fact which these universally distributed fungi perform in the work of decomposition. They may be forced to fructify sometimes by placing them in a globule of water surrounded with air in a closed cell, but till this is accomplished it is worse than useless to give them names. Moulds are capable of producing even more compact bodies than these, as is shown by the Sclerotia of apples, pears, and onions, which are undoubtedly conditions of common moulds. The fruit as you here figure it is precisely that of the yeast plant, which I have found to consist of Mucor, Penicillium, &c.

I have a notion that hospital gangrene is produced or aggravated by Fungi. Have you ever examined the limpid drops

which form on meat just beginning to putrify? It is undoubtedly of a fungous character; and, as I believe, a condition of some common mould.

In No. 2 I find merely cheesy bodies, consisting of a mass of irregular, minutely granular bodies, like those of some of the minute Algæ figured by Kützing, as for example in *Microhaloa firma*. It did not arrive, however, in as good condition as the other, and as it smells abominably, it has probably decomposed on the passage. The spores in the Madura specimen which I have not seen, remind one somewhat of *Sarcina*, which I believe to be a condition of some mould. I have however in vain tried to coax it into growth, though it lives for many months in sugar and water. I have found a *Sarcina*, or rather Dr. H. O. Stephens has, of an orange colour on rotten bones, which convinces me that it is a fungus. Very few Fungi have been sent from Bombay, and scarcely any of interest, though I know not why you should not have some good species as well as Ootacamund. As, however, they are not to be met with during the rains they have been much neglected....Sikhim is wonderfully productive, but the more Northern Himalayas, as Cashmeer, are unproductive.

I am, my dear Sir,
Very sincerely yours,
M. J. Berkeley.

Notes of fresh Cases.

1. *J. J. Hospital, Bombay.*—1. A Mussulman, *ætat* 27, a sailor, native of Persia (near Bander Abbas): the left foot began to enlarge 10 years since, after a fall: the swelling presents all the characters of Mycetoma: black particles may be picked out of the sinuses, and when examined microscopically, exhibit cells and fibres: no pain or constitutional disturbance: will not submit to operation.

2. A Hindoo, *ætat* 30, a carpenter from the Deccan (near Nassick): the left foot is affected characteristically, and to a considerable extent: the disease began one year since with an abscess in the sole, during the cold season. In reduced health: the foot is painful. Amputation was performed September 26th, 1861, and he was discharged cured at the end of October.

In general form and appearance this specimen resembles others previously described. The tarsus is chiefly affected: the toes are free. Numerous sinuses open on the dorsum and sides of the foot, and a large cluster of

openings is seen in the middle of the sole: most of them discharge a thin purulent fluid, and in some of the apertures small black particles may be seen; these are the fungi, and their nature was clearly made out before operation.

A section of the foot was made immediately after removal, and the appearances preserved in a sketch. The black masses and granules located in the spherical cavities and tubular canals were imbedded in a whitish, semi-opaque, glairy substance of homogeneous consistence: the walls of the canals had an opaque yellow colour and were readily torn. The whole of the soft parts around them were converted into a gelatiniform substance which takes the place of the muscles: the tendinous and fatty structures are less readily changed. On examination the glairy material enclosing the fungi was found to be composed of pus cells, large granule cells, numerous small clear corpuscles, and a few blood particles: the opaque yellow walls of the canals had no peculiar features, the colour seemed to be owing to aggregation of (fat) granules. The gelatiniform substance presented traces of muscular fibre, granules, &c.

A very careful examination of the fungus particles was made (at which I had the assistance of Mr. H. J. Carter), but no new or striking features were detected beyond what has already been described. The larger particles had the consistence of decayed woody fibre, and readily tore in a radiated direction. As stated in my first paper, the central part is composed of clear yellow fibres; these have no distinct walls, but resemble in appearance and disposition the yellow elastic tissue found in the middle coat of arteries; acetic acid has little or no effect upon them. Intermixed are beaded fibres, the septa of which are sometimes absent, as if these fibres were passed into the homogeneous form. The circumferential part of these fungus particles is darker in colour and has a tuberculated aspect, fragments are readily detached, which then have all the characters of the smaller particles. They are composed of large and small cells, some clear, some coloured.

Iodine produced a fine clear orange colour, but the presence of starch was not clearly made out: on the first occasion, when this form of Mycetoma was examined in a fresh state, mere traces of starch were detected, more readily it seemed, by Iodine only, than when sulphuric acid was previously applied.

From Kutch.—1. A Hindoo, *ætat* 27, shepherd: "the right foot is irregularly swollen on both dorsal and plantar aspects, and is covered with numerous small openings from which there is a scanty, thin, sanious discharge." No pain: is thin and weak. The disease began fifteen months before admission as a small hard swelling in the sole, with little pain: two months afterwards an opening formed, and black granules, like seeds, began to come out from time to time. Amputation of the leg was performed November 12th, 1861, and he made a fair recovery. On section it was found that the greater part of the growth was in the subcutaneous cellular tissue in the neigh-

bourhood of the openings: the black particles varied in size from a pin's head to a split pea; they were very abundant and characteristic.

2. A Hindoo, *ætat* 40, cultivator: "the left foot is swollen to about three times the size of its fellow;" this is more marked on the plantar aspect, and extends the whole length of the sole: it is penetrated everywhere by small openings, through which the probe readily passes down to bone: in some parts are soft elevations which, when they burst, give exit to a quantity of thin matter containing granular bodies, the size of mustard seeds. The disease is of very long standing, it began by a vesicle on the sole, from which granular and purulent matter were discharged; the swelling then subsided, but seven years ago other vesicles appeared, and the disease has progressed ever since. Is somewhat reduced, but does not suffer pain or fever. November 26th, amputation was performed in the upper part of the leg, and the patient progressed favourably afterwards.

I found the diseased foot to be very characteristic in appearance, the apertures in the cuticle had the same circular concentric arrangement, with a central opening where a sinus had formed, as I had previously observed in the first variety of Mycetoma. On section great disorganization of the tissues of the foot was seen—bones and soft parts being bored and excavated in all directions, and the canals and cavities occupied with whitish mulberry-like masses of minute size, and soft consistence: their number was very great, and under the microscope they exhibited the usual structure, a finely granular central body surrounded by a crystalline envelope: certain peculiarities observed in them will be described further on, and it should be noted that around the sinuous apertures on the surface, minute pink streaks and discolouration of the cutis were apparent.

Mr. S. Hemraz, who furnished the notes of the above two cases, informs me that he once saw the disease in the hand: the patient was a female, and the swelling of considerable size.

From Kurrachee.—1. A Hindoo, *ætat* 40, labourer, native of Kutch: duration of disease 3 years. The left foot is four times larger than the right; as is often the case, the toes only are free: there are the usual appearances, and it is observed that white granules are occasionally discharged from the sinuses: the disease began as a hard painless tumour in the sole of the foot. The patient was free from syphilitic or scrofulous taint. Operation deferred.

2. A Hindoo, *ætat* 57, confectioner, native of Kurrachee: duration of disease 6 years. The left foot is swollen about the ankle: there are numerous sinuses discharging purulent matter containing 2 or 4 granular bodies every day (!): the foot measures 19½ inches in circumference; first of all a painless tumour was observed below the inner malleolus. The patient has never had syphilis, and has never been out of Kurrachee for the last 30 years; health reduced: will not consent to operation.

3. A Hindoo female, *ætat* 13, native of Kutch: duration of disease 6 months: diagnosis doubtful. There is a small swelling and a sore in the sole of the right foot: the discharge is puriform or sanious.

From Mr. Bazonjee's account, the nature of the disease cannot be stated with certainty. In probably all cases of doubt, and they are frequent, the guide must be the microscope, with which the discharge from a *recent* sinus, if possible, is to be examined; I have little hesitation in saying that a correct diagnosis can thus be made.* The three cases just narrated by Mr. B. Rustomjee were read before the Grant Medical College Society last October: the author was inclined to identify "Mycetoma" with a kind of swelling and ulceration of the foot termed by Mr. Millar, of Edinburgh, "Podelkoma:" the latter however seems to be hardly a specific affection, and most assuredly had the former ever occurred in England, it would before now have been recognized as in every respect a most interesting form of disease, and of its kind unique; it is therefore unnecessary to dilate on the subject of their identity.

Remarks on the Structure of the Fungi in Mycetoma.

1. *First Variety.*—To the description (brief and imperfect, owing to absence from Bombay on sick leave) already given of the larger particles or masses,† I have little to add: the smaller particles show the same elementary parts, which are as follows:—1. Clear, orange-brown cells, $\frac{1}{4000} - \frac{1}{1500}$ inch diameter, globular or angular, adherent and often arranged in radiating series: these give the colour, and form the chief mass of the particles. 2. Clear, spherical, colourless cells (spores?), usually of larger size, some being more than $\frac{1}{1000}$ inch diameter,

* Should however the sinuous apertures be of long standing, it is evident that the greater number of fungus particles (on the detection of which diagnosis mostly turns) may have been already expelled, and very few or none, at times, be present in the discharge: from this circumstance the microscope may sometimes fail to afford any assistance. This I have recently experienced when examining two patients at the J. J. Hospital, one of whom had the hand, especially the thumb, enlarged, with other marks of Mycetoma, but it was concluded that the disease was essentially scorbutic caries. In the other case there was considerable enlargement about the heel and ankle, with several sinuses, besides a general resemblance to Mycetoma; microscopic examination of the discharge here too failed to assist the diagnosis. By a triple incision the *os calcis* was exposed and found to be sound, that is to say not carious, and tracing the sinuses down to the bone, I was not able to detect any 'canals' in it, continuous with them: hence the diagnosis remains doubtful; the patient is now rapidly recovering from this exploratory procedure. It is within the range of probability that a spontaneous case may occur in certain cases.

† L. c. p. 134.

irregularly interspersed amongst the former; sometimes forming a considerable part of the smaller particles, in which they are more abundantly found. 3. Very distinct, cellular, beaded filaments $\frac{1}{8000} - \frac{1}{4000}$ inch diameter, arising, often at least, from the last-named colourless spores, and terminating frequently in a dilated cell, sometimes coloured, which when detached would resemble No. 1. 4. Large characteristic spores, comparatively few in number, averaging $\frac{1}{1100} - \frac{1}{800}$ inch diameter, form ovate or spherical, of a deep orange colour, either uniform, or confined to the contents (*nucleus*) or the thick outer wall (*epispore*): they are found imbedded in, but otherwise unconnected with, the other constituents of both large and small particles: they were figured in my first article, some germinating, and several varieties are delineated in the accompanying illustration. Besides a few small cells loaded with pigment and others clear, the small fungus particles contain no other structures, but in the central parts of the larger, and also in certain minute *brown-stains* seen in the menbrane lining the canals which lodge the Fungi, we find No. 5, a decided mycelium of yellowish, homogeneous, branching fibres, the smaller non-septate, the larger sometimes having the appearance of tubes containing bright particles (and liable to be mistaken for blood-vessels in the latter position): diameter $\frac{1}{6000-1000}$ or more: they were figured in my previous paper. In the membrane lining the canals I have seen cell-bearing filaments springing from this Mycelium, bearing cells like those noticed under No. 7.

The following is the best account I can offer of the growth and development of the black fungus. The large brown spores by germination produce the mycelium, from which the brown cells forming the mass of the fungus arise: amongst these the large colourless cells are developed, some of which sprout at once into fibres, terminating either in other colourless cells, or small brown ones, the increase of the mass being thus provided for (I never saw one of the latter multiplying itself by division): others are probably converted into the large spores. Adopting this view, the smaller fungus particles are detached growths either once adherent to the sides of the canals, or constituting

the outer layer or crust of the larger masses. These latter comprise the entire growth: their central part being composed of the radiating fibrous mycelium, and the cortical part of the organs of fructification. Accordingly we must suppose growth commences in the walls of the canals, to which the spores become adherent, or perhaps in the formation of the large particles they sprout unattached: in whatever mode it takes place the process is most active: no more striking, almost wonderful, sight can be seen than the canals and cavities forming the mass of Mycetoma, crammed with glistening jet-black particles making their way to the exterior.

In the explanation of the figures will be found many details it is not necessary to repeat here: reference should also be made to the plate illustrating my first paper.*

With regard to the position of this Fungus, there can be little question that it belongs to the simpler forms of the class—the Coniomycetes: of the several families of that order it may be allied to the Torulacei, Uredinei, or the Ustilaginei, I believe one of the two latter, probably the last-named, which includes many of the parasitic entophytes so destructive to grasses and some flowering plants. This opinion is chiefly based upon the almost identical structure of the spores in both cases, and unless similar bodies may occur in Torula or the Mucors, this fact would be decisive. The special *habitat* of Ustilago (or *Tilletia*), in the deep-seated part of plants, furnishes an analogical argument of some force: is it not possible that the species infesting common Indian grasses, &c. (*e. g.* Sorghum, or the Maize, or Mango), if transplanted into the human foot, might give rise to Mycetoma? The disease would then be really a blight of a part of the human body, identical in nature, course, and effects, with the destructive agencies so hurtful to man in a less direct manner by spoiling his food: its origin common with them: but to say with which particular species is yet impossible, and may long remain obscure, just as with the *Guineaworm* of man, the identical Filaria which produces it being still unknown: remembering that *Fungi*, like all rudimentary forms of organized matter, are capable of assuming very

* L. c. p. 134.

various phases, according to conditions of development, &c. and such variation from a normal standard (if that there be) being highly probable in the instance under consideration, no surprise would be felt if this obscurity remain for long impenetrable. The fungus of Mycetoma, if not new to science, may be an abortive, or a monstrous form of some species of the genus Tilletia, or Ustilago; to say more, if even this be warrantable, is not within my power.*

As to the manner in which a part of the human body thus becomes and continues to be infested with this parasite, beyond the extreme probability that its spores are introduced from without, and, germinating, gradually invade the deeper parts by frequent branching, often furnished with lateral and terminal dilatations, in which, as well as in the canals or ramifications themselves the fungi are developed, observation has not yet furnished more than ground for surmise. In the case of members of the vegetable kingdom, it is supposed that sometimes the sprouting seed or older plant becomes infected through the root or surface by the introduction of molecules derived from the spores of Fungi or their filaments: in other cases the mycelium produced by the germination of the spores has been found to penetrate the epidermis directly, and in the case of one species, parasitic on a Composite plant, its filaments have been seen to enter the stomata.†

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* Mr. Berkeley observes that moulds may give rise to very compact substances: and the same is true of the bunt or brand of grasses; that species attacking the maize, for instance, when seated in the stem, produces tumours which may be hard enough to allow of division into thin layers: in one case, the tumour contained a "tenacious, flexible, and pellucid substance of a brown colour which cut like soft cartilage." Dr. Imhof, the observer, also experimented with the spores of *U. maydis* for a fortnight, he swallowed daily about a drachm diffused in water, and also spread them on a wound accidentally made at the ankle; no effect, good or bad, followed in either case. See Tulasne's Memoir on the Ustilagineæ. Ann. d. Sc. Nat. 3 ser. Bot. vol. VII. and also 4 ser. vol. II. (See also my previous paper. loc. cit. p. 140.)

† The species referred to (*Æcidium Tussilag.*) belong to a genus ranged by Tulasne in the Uredinei, by Corda, however, who made the observation, it is placed at the head of the *Myxogastres*. Now very recently it has been stated that in this family the filaments of the mycelium exhibit a creeping movement and a changeable form, like what is observed in the *Amœba*—the lowest of all animal life: and on looking into the

It is a fact worth noticing in connection with the prolonged duration of Mycetoma, that a plant (like the human foot) once infested with these parasites will remain so for years in succession.

2. *Second Variety.*—Four distinct forms of the lighter-coloured fungus were distinguished in my previous paper, the last mentioned of these should however be transferred to the first variety; the mahogany-coloured particles being really identical with the small black ones, only having undergone certain changes: the necessity for this transfer shows how the two varieties of this unique disease blend with each other, and are easily confounded.

In the last specimen received, one of those from Bhooj, the fungus particles were noticed to present certain peculiarities; their crystalline coat was furnished with a secondary finer fringe resembling rows of cilia, and the detached fragments, varying extremely in form, had much the appearance of ciliated epithelium from the respiratory tract: æther rapidly and completely dissolved them. More to be noticed is the circumstance that in the interior of many of the particles numerous brown granular and rounded bodies were seen, which might readily be taken for spores: their average size was $\frac{1}{2500}$ inch but not very uniform: the presence of a cell-wall was very doubtful: on one occasion a single oval body $\frac{1}{800}$ by $\frac{1}{1000}$ inch was seen, of an orange colour, and like the smaller ones, firmly imbedded in the mass: seeing that they were occasionally blended, and could by pressure often be made to coalesce, and considering their various size and general appearance, I am inclined to regard these bodies as oil globules formed in the interior of the fungus particles in the

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figures of Tulasne's plates illustrating the germination not of the Uredos only, but of Tilletia and Ustilago also, the resemblance between what he terms Sporidia and *Amœba* is sufficiently close to excite the suspicion of their really being identical, and of the accuracy of Du Bary's assertion. It is clear that spores, thus endowed with locomotive powers, would find little difficulty in entering the stomata of plants, as Corda witnessed, and as suggested to me by Mr. H. J. Carter, it is easy to understand how an Amœba-like spore might make its way through a natural or artificial aperture in the cuticle of the human foot, or even pass directly through the epidermis, and in this manner the germ of the fungus be introduced.

course of degeneration. The action of reagents was doubtful, but tended to confirm this view. These appearances are figured in the plate, Fig. 4: similar but less distinct bodies were seen by me sometime since when examining specimens that had been mounted in spirit.

With regard to the nature of these curious, light-coloured, soft fungus particles, no new light has been thrown on this part of the subject since the publication of the last volume of these Transactions. I am still inclined to view them as having originally had a distinct cellular structure, and having subsequently undergone degeneration: the actual occurrence of particles similar in appearance, position, &c. which had such a structure, is in favour of this opinion, besides, in that instance some were seen in the process of degeneration, and traces of a solid fatty fringe (stearine or *margarine*) could be detected around them. Otherwise what view can be advanced? Mr. Berkeley, in his letter, states that he noticed merely cheesy bodies consisting of a mass of irregular, minutely granular particles, like those of some of the minute Algæ. I have never been able to see more than minute granules imbedded in a homogeneous mass, occasionally it seemed as if these granules were disposed in rows, or attached; they are highly refractile and spheroid in form, and the same appearances extend throughout the fungus particle. Frequently the latter had a distinct wall. Dilute nitric acid produced little effect. Iodine was found to indicate starch in some cases. Older specimens showed often a distinct wall, sometimes thick and marked with small nuclei (?). If it seem improbable that these particles were ever composed of minute beaded fibres, and I own that in some case this must be admitted, as, for instance, the little pink-coloured bodies seen in one specimen (*l. c.* p. 118), then the view which supposes their affinity to the compound spores of some Uredos, &c. seems the only alternative: indeed I was formerly inclined to adopt this view. But who can tell all the modifications these insignificant (but most important*) vegetable forms are susceptible of under

* Tulasne thus defends his own and similar studies: "il n'est point d'être au monde, si petit, si obscur qu'il soit, qui n'ait sa place marquée parmi les créatures et un role défini à remplir: puisqu'il a été appelé à la vie, l'homme, interprète

various conditions of development and nutrition? It is well known that the phases of animal life are susceptible of very great modifications, according to external circumstances; without adopting the 'advanced' opinions of Darwin, all will admit that the species of the lower forms of animal life are often based on most unstable characters. The *Filaria medinensis* is regarded by Carter and Busk as an abnormal development of some unknown species in which the individual becomes converted into a huge generative apparatus, owing to the peculiar conditions in which it is developed. No one ever saw a Filaria 3 feet long and crammed with myriads of young, outside the body of the animals infested by it, even in places where these creatures naturally abound. It may be fairly asked, is not the *fungus* of both varieties of Mycetoma also a monstrous form of a species under ordinary circumstances distinguished from its allies by minute points of distinction only? These abnormal forms are usually abortive, but the chance of being able to watch development is probably greater in the case of the Fungus than in Filaria, and to this point future observations should be directed. Semination of the fungus particles themselves (preferring those of small size as being probably more likely to divert towards a natural mode of development in growth) or of fragments of the pink stains in the skin, in rice paste, water, moistened earth, &c. with free exposure to air and light, or in the dark, might be done: if in localities where Mycetoma prevails, any circumstance should lead to the suspicion that certain kinds of moulds, or certain soils or plants, seeds, &c. furnish spores, these too might be similarly experimented with. It may be that information will

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né de toute la nature, ne fait point un vain usage de ses facultés quand il les applique à l'examen de tels objects. *Omnis creatura parva quidem et vilis, puris corde speculum vitæ est, et liber sanctæ doctrinæ*.....Entre toutes les considérations qui pourraient être invoquées en faveur de nos études, et satisfaire au *cui bono* décourageant des certains critiques, il en est une qui ressort du subject même que j'ai à traiter. On sait trop, en effet, quels fléaux sont devenus pour nos cultures divers champignons parasites plus ou moins analogues aux uredinées, et quel dommages celles-ci peuvent elles-mêmes causer à nos moissons ou aux légumes de nos potagers." Surely the same line of argument is applicable to the subject under investigation: let every one inclined to take it up in earnest, be encouraged and sustained by such considerations.

thus be obtained of greater interest than concerns the individual case, and capable even of throwing light on the whole subject of Parasitism.

The connection of the two varieties of Mycetoma.—This is still obscure, although many considerations point in an affirmative manner. Recently the following fact has come to light, viz. that in a specimen of the second variety (from Bhooj) are found the same pink-coloured streaks in the skin and subjacent tissues as were described (*l. c.* p. 133) as indicating the early stage of the first variety: and the same spores (?) are seen in both cases, hence the question now arises, are these stains in the skin essentially connected with the disease? A question which must be answered in the affirmative: their position in close relation to the apertures on the surface, their branching into the deeper parts, prefiguring as it were the future canals, and more especially their contents, point to this conclusion. Admitting this, we may enquire what is their relation to the fungus-growth? The circumstances just mentioned lead to the inference that the pink spots show the first stage or commencement of the disease; since they are identical in the two varieties, the inevitable conclusion is that both forms of Mycetoma begin in the same manner, and from identical spores (?) It has appeared to me that it is possible to trace the formation of the fungus-particles in the second variety from the coloured bodies contained in the pink stains (see Fig. 3). How the black fungus might arise I have seen nothing satisfactory to indicate: towards the elucidation of these points observers favourably placed might also turn their attention.

In conclusion, the present seems a fitting opportunity to gratefully acknowledge the very valuable assistance I owe to my friend Mr. H. J. Carter, F.R.S. The approaching departure of this Officer from India, will be such a loss to the scientific community as must for a long time be irreparable.

Fig. 1

Fig. 2

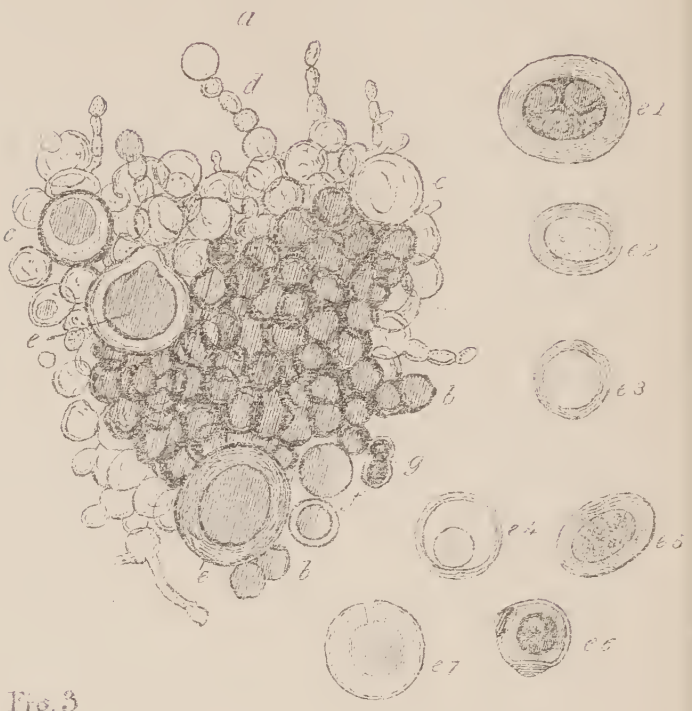

Fig. 3

Fig. 4

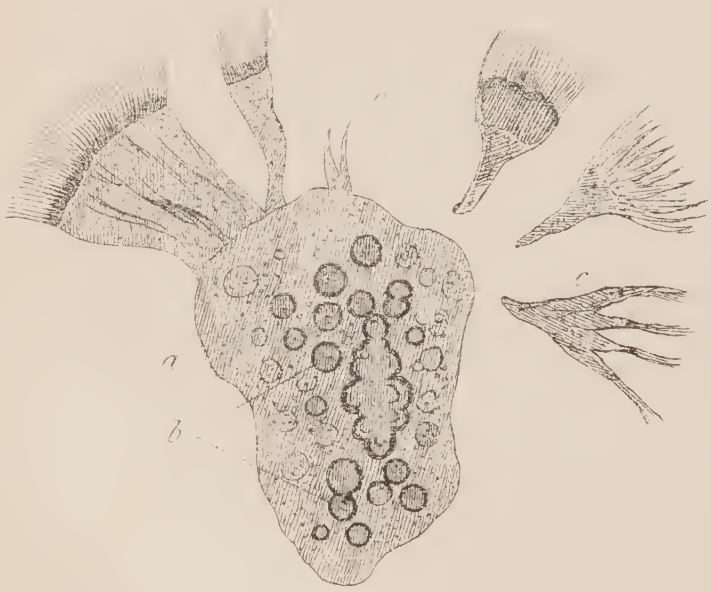

Fig. 5.

Description of Plate III.

Fig. 1.—The contents of the pink-coloured stains or streaks in the cutis and subjacent tissue. Acetic acid has been added.

a. Spherical or oval groups of minute particles of a bright orange colour: sometimes they contain in their midst one or two of the round cells (or spores ?) *c*. Free cells often of a deep orange or purple colour, and of varying size: it is possible they are spores.

These stains or streaks require further investigation: they are by no means of the character they might be mistaken for, viz. small effusions of blood: but are probably an early stage of development of spores introduced from without, through a natural or accidental aperture on the surface of the skin.

Fig. 2.—The structure of the small black fungus-particles of the first variety of Mycetoma. *a*. The entire particle, a portion of which is lighter coloured than the rest. *b*. Small clear orange-tinted cells which form the chief mass: usually placed in apposition and adherent. *c*. The clear colourless cells (spores ?) intermixed with the above, and often aggregated together. *d*. Beaded filaments proceeding from the latter, frequently terminating in an expanded and it may be coloured, vesicle. *e*. Large coloured spores (sporangia ?): they consist of an outer coat, on *epispore*, often of considerable thickness, and a *nucleus*. Some varieties are shown:—*e* 1. Large brown spore of which the nucleus appeared to be compound, and granular: rare. *e* 2. One, the walls alone being coloured, of smaller size and oval form. *e* 3. A round spore, the nucleus of which is refractile and colourless. *e* 4. A spore showing a rounded, coloured and clear nucleus, only partly filling the interior. *e* 5. In this instance the nucleus is of deepest colour and slightly granular. *e* 6. A spore exhibiting bulgings in the outer wall: re-agents had been added: only once seen. *e* 9. A spore showing a fissure in its coat, which may however have been mechanically produced. *f*. Clear brown cells similar to the contents of some of the spores. *g*. A cell loaded with pigment (dividing ?).

Fig. 3.—Structures seen near the apertures of the canals (Bhooj specimen, second variety): they seemed to indicate the mode of origin of the soft light-coloured particles. *a*. An oval spore with bright red cells in the interior: it strongly resembled an advanced state of the spores above described in the pink-coloured stains. *b*. A similar body of larger size. *c*. A further stage of development, the coloured nuclei are becoming indistinct. *d*. A small particle resembling in everything but size the ordinary ones found in all the canals.

Fig. 4.—A separate particle from the same specimen as Fig. 3, showing the fungus and nuclei (?). *a*. The entire particle, a portion of the fringe having become detached. *b*. The coloured globules seen in the interior, which have the appearance of spores or nuclei, but were probably oil globules: see the

text, p. 215. *c*. The compound crystalline fringe, some fragments being detached. These fragments present very various forms, being sometimes simply acicular, or pointed at one end, and at the other presenting a feathery or brush-like appearance, or strongly resembling ciliated epithelium, being furnished with secondary or even tertiary rows of smaller crystals. It is particles of this kind that were long since described by Dr. Ballingall, and quite recently by Dr. Bidie (Madras Quarterly Journal of Medical Science, No. VIII), the latter author does not seem to have detected the real nature of the crystalline fringe. Being composed of a fatty principle it is entirely dissolved by good æther. It so happened that having made use of æther saturated with fat, my friend Mr. H. J. Carter was at one time inclined to view this peculiar appendage as an organized structure, and was at the pains of making several sketches of the various forms it assumed: I was enabled however to obtain some pure æther from the College Laboratory, and he then found the whole to be dissolved, thus confirming the opinion which I had before put forth.

In the article alluded to Dr. Bidie states that he occasionally noticed a blue tinge in the particles on the addition of a solution of Iodine and Sulphuric acid (as stated in the text, the presence of starch has been established: starch grains having been found in both varieties of the disease), but this fact alone would not, I think, warrant the conclusions the author seems to have unhesitatingly come to concerning the nature of the granular particles or bodies: it is full two years since the views here advocated were proposed and published, and at that time, amongst others, this writer first learnt that a fungus-growth was present in connection with this peculiar affection of the foot.

Fig. 5.—*Distoma hepaticum* (?) *a*. The natural size and form of the parasite; the under surface or venter being seen, at the anterior extremity of which are successively the opening of the sucker, the genital pore, and the mouth. *b*. An ovum, taken from the parenchyma, near the tail.

For the case and further remarks, see Appendix, p. xxx.

THE FUNGUS-DISEASE OF INDIA (**MYCETOMA** AUCT.) *THE FIRST OR BLACK VARIETY.*

Description of Plate IV.

This figure which represents an ideal section of the diseased foot, is based upon dissections, and on three sketches made immediately after amputation of the limbs.

a a. The *fungi*, some of which are globular and of large size, others smaller and more irregular, and others mere granules. The former are lodged in the spherical cavities in the bones figured in my previous paper (Plate III).

b b. The *canals* in the soft parts and bones, which lead to the free surface of the skin. They frequently communicate, and are lined by a continuous membrane: in them are contained the fungi. (In a diagram of this sort it is impossible to represent the soft glairy material which also occupies the canals).

c c. The *apertures* on the surface where the canals terminate. They are often very numerous, and frequently in them may be seen imparted the black particles.

d d. The pink-coloured *stains* or *streaks* in the skin, above described. They are common to both varieties of the disease, and by them it is supposed the growth is multiplied.

It is to this variety of the affection that the term "fungus-disease," which correctly expresses its nature, was *par excellence* originally applied. Hitherto no other instances of it have been distinguished, except those described by me, hence it may perhaps be regarded as comparatively unfrequent: the fungus-particles, or masses, are of a deep black colour and of firm consistence: they are sometimes as large and as round as a pistol-bullet.

In the *second variety* of Mycetoma we find three or four different kinds of particles; these however are always light-coloured and soft, and generally very small, or minute. Of them only one form, certainly the more common, has been noticed by writers; it is that in which each particle is seen to be invested by a crystalline coat. The other forms have occurred but once, and it was entirely owing to the case recorded in the Volume of these Transactions for 1860, p. 115, where the fungus-structure was most distinct, that I was induced to apply the term "fungus-disease" to this variety also. The truly fungus nature of the more common kinds of granules or particles, and of that striking instance from Madura (*l. c.* p. 117), is as yet only matter of inference—based on the grounds furnished mostly by the article alluded to.

It seems desirable that every step in the investigation of this disease (the elucidation of which is committed, as it were, to the Medical officers of India) should be based on direct and repeated observation, and that speculation be refrained from, as being at least useless.

*** It is believed that, *mutatis mutandis*, this figure would correctly represent the disposition of the parasitic growth in the other variety of Mycetoma.

APPENDIX A.

Extracted from the Indian Annals, No. XIV., Sept. 1861.

J. E. T. Aitcheson, M.D., Civil Surgeon, Jhelum, p. 517.

Case 1.—Fe. 35.—Foot; absence of pain on moving the limb, and of constant gnawing pain, &c. are noticed; tubercular nodes and thickening of the skin.

Case 2.—Fe. 30.—Wrist; two years; disease confined to skin and subcutaneous cellular tissue, tubercles present and superficial sinuses. The actual cautery was applied on the dorsal and palmar aspect of wrist; the sinuses closed, and the ulcer healed, no deformity remaining.

There is an absence of proof positive that this case was one of Mycetoma.

Case 3.—M. 48.—Right Foot; disease of considerable extent. Syme's operation for removing foot performed.

Case 4.—M. 28.—Foot; disease had not extended deep, actual cautery used without much benefit.

Case 5.—Fe. 30.—Foot: case not detailed.

Dr. A. looks upon the thickening of the skin; dull pain only felt when the part is moved: the early appearance of sinuses (not leading to bone !) as characteristing Mycetoma. Serofulous affections are distinguished by acute pains on movement, a constant gnawing pain, often worse at night, also deep-seated and frequently sympathetic referred to another joint: sinuses appear late and lead to the joint.

Mr. P. Minas, l. c. p. 521.

Case 1.—M. 12.—One month: Ball of great toe (left); three fistulous openings through which small black granules oozed out: it began with vesicles. Health good. Nit. Silv. and Poultice, Iod Pot. in 20 days was discharged cured. "It remains to be seen if the cure is permanent."

Case 2.—Fe. 45.—Seven years: Left Foot; very extensively affected, measuring in circumference 16-17 inches, and weighing after removal (with part of the leg) 5lb. 14oz.: amputation of leg; doing well. Emaciated but not much otherwise affected: the disease began by a vesicle in the great toe, followed by dull pain and swelling of the foot.

APPENDIX B.

On a Red Mould which appears in connection with Mycetoma.

Upon specimens of both varieties of the fungus-disease placed under very different circumstances, there has appeared, on three occasions, a form of mould not seen by me elsewhere. The first time it was observed was in the month of May, last year, growing upon part of a diseased foot which had been placed in water for the purpose of maceration: its duration previous to accidental discovery could not have been long, and a few weeks afterwards it ceased to spread. The next occasion of its occcurrence was this year, in the month of April, in connection with a specimen of Mycetoma preserved in spirit; and the third was on rice paste in which fresh black fungus-particles had been placed, in order to ascertain if they could be made to grow artificially; also appearing about the same time.

On each occasion this mould has presented the same characters. As above stated, it has not been seen anywhere except in connection with the fungus-disease: it is worthy of notice, too, that it has appeared at only a certain time of the year, and then for a limited period. These facts might be regarded as indicating that the mould is essentially related, in some way, to the fungus-disease itself, and possibly as the original form of the fungus-growth. It is almost needless to observe that the discovery of the parent of this wonderful disease—the demonstration of its primary source—would be of considerable interest, and even of pathological importance; but I am by no means inclined to assert that this is accomplished, and the above-mentioned facts must speak for themselves.

This new growth is of a fine red or crimson colour; under favourable circumstances it attains a thickness of upwards of a line, has a tough consistence, and below the surface the colour is much paler. Such were the characters of the specimen which grew on the macerating bones; this, too, appeared to spread on the surface only, and from no particular point. In the second instance its growth was equally luxuriant, and was accompanied by a white down-like covering, in parts: here also

it appeared only in that particular bottle containing a specimen of Mycetoma, although there were many other bottles on the same table, equally exposed. In the third instance the red mould appeared on moistened rice paste placed in a glass cell, along with a few small black fungus particles taken from a foot which had an hour or two previously been amputated at the Hospital close by (see the case p. 209): while these latter remained unchanged, at the end of four months the mould made its appearance, but not in direct connection with the fungus-particles; the microscope also showed that the cells and spores of the latter so far from sprouting, &c. were slightly shrivelled, or wasted.

The mould consists of a mycelium of yellowish, jointed, and branching filaments, some of which bear at their extremities the *sporangia*, or spore-capsules, the diameter of which is $\frac{1}{300} - \frac{1}{400}$ inch: the smaller containing spores of a red colour, the larger colourless ones. It will not be necessary to point out how it differs from each form of the pathological fungus, but this short record of its occurrence ought not, perhaps, to be omitted.

NOTES ON THE EXTRACTION AND ESTIMATION OF SOME OF THE CRYSTALLINE PRINCIPLES OF OPIUM.

By R. HAINES, M.B., Professor of Materia Medica, Grant College, Bombay.

The literature of Opium and its constituents is already so copious that I feel aware that some apology is due for the attempt to make any further addition to it. I must, therefore, ask the indulgence of the Society if, having been much engaged with such opiums as are met with in this country, I have thrown together a few notes of my experiences.

In the year 1856, learning that there lay in the Medical Stores some 300 or 400 lbs. of Khandeish Opium, unsaleable on account of adulteration, and for the same cause not considered suitable for issue for medical purposes, I got permission to make a preliminary trial upon it, and having found that it would yield five or six per cent. of muriate of morphia, I made an offer to the Medical Board to extract all the morphia from it in the form of muriate. The offer was accepted, and I commenced operations, in the first place upon 200 lbs.

In choosing the process to be adopted, I was obliged to have regard to the nature of the appliances at my disposal; my vessels and furnaces being but small, I preferred to avoid, if possible, great boilings and filtrations. The extraction therefore with a sufficient quantity of cold water, and the filtration and expression, were effected at the Medical Stores, though not, I fear, very completely.* The filtered liquors being collected, solution of ammonia was poured in with vigorous stirring, until a distinct ammoniacal odour was perceptible.

* The marc of this portion, and of the succeeding 100 lbs., was unfortunately not preserved, as it might have been, for the extraction of the narcotine.

About 1 lb. was required for every 10 lbs. of opium. The first effect of the ammonia was to precipitate a vast quantity of resin, which by stirring soon balled together into a tough pitchy mass. This could be at once removed. After some hours the morphia was deposited at the bottom and sides of the vessel in distinct granular crystals of a pale brown colour. The crystals after being washed were dissolved in hydrochloric acid, and the hydrochlorate of morphia purified in the usual way. The resinous mass I found, rather to my surprise, to contain besides the greater part of the narcotine of the liquid, a large quantity of morphia enclosed as crystals within it. In order to utilize this morphia, I first attempted to treat the mass like the first crystals, by solution in hydrochloric acid and crystallization, but I found that so viscid and pitchy a mass resulted that the crystals would hardly form in it. I was therefore driven to endeavour to get rid of the resin before operating upon the enclosed morphia. Treated with twice or thrice its weight of boiling alcohol the resin softened and dissolved, but as the temperature fell the greater part separated. The spirit was poured off, and the resinous mass while still warm and soft was folded in strong calico and subjected to very gradual but ultimately powerful pressure. An exceedingly tough black mass was very slowly forced out, and at last a light brown cake of morphia and narcotine was left in a state fit for solution in acid. Although I had carefully studied the accounts given of the various processes for extracting morphia, I had not been led to expect exactly this behaviour of the aqueous solution when treated with ammonia.

In a subsequent operation the precipitant used was carbonate of soda. Less resin was thrown down, and the morphia was lighter in colour, but not quite so abundant, and the precipitation did not appear to be so complete. The watery solutions from which the morphia had been precipitated were not thrown away, but were preserved for the operations presently to be noticed.

One reason why I adopted the above process in preference to that of Gregory, was that the results of a preliminary trial on a few pounds of opium of what I believed to be that pro-

cess, had been unfavourable; for after the addition of chloride of calcium and evaporation to a syrup, the hydrochlorate of morphia crystallized with extreme slowness and very imperfectly, so that, after standing a month, more than half the salt remained in solution, and it was at last necessary to separate the morphia by diluting the expressed fluid with water and precipitating with ammonia. In this case I followed the process as detailed in the Edinburgh Pharmacopæia of 1841, which, as I afterwards found, omitted one most essential step, without which in fact complete success is impossible. In the process as originally devised by Gregory in 1831,* the directions are to add the chloride of calcium to the concentrated liquid, and then to pour the whole into a large quantity of cold water, which causes the separation of abundance of resinous flocculi, after straining off which the liquid may be again evaporated to crystallization. Not only is this step omitted in the Edinburgh Pharmacopæia of 1841, but it is omitted by Gregory himself in his Handbook of Organic Chemistry. The London College, however, in the Pharmacopæia of 1836, substituting chloride of lead for chloride of calcium, does not neglect this part of the process. It is, in fact, a most essential one, for the quantity of resinoid extractive matter got rid of by this simple means is something enormous, and the liquid now freed from it leaves on evaporation a thin aqueous syrup which scarcely interferes with the crystallization, instead of the tough viscid black mass of the former case.

The last portion of the opium, consisting of 71 lbs, was treated in this way by the chloride of calcium process, and with perfect success. The total yield of pure hydrochlorate of morphia from the first 294½ lbs. of opium by the precipitation method, was 14 lbs. 5 oz. 6 dr., or 4·87 per cent.; that of the last 71 lbs. 11 oz. of opium, 4 lbs 1½ oz., equal to 5·71, or nearly 5¾ per cent., after the extraction of the codeia; the increased quantity in the latter case being, perhaps, partly due to the greater care taken in

* I cannot find the original paper, and therefore I have drawn my account from Geiger und Liebig's Handbuch der Pharmacie, 1843, Band I. s. 1191,—a work which for fulness and accuracy cannot be too much commended.

exhausting the opium, which was done by myself in the College laboratory. In this way a total of 18 lbs. 6 oz. 14 dr. of hydrochlorate of morphia of the best quality has been supplied to the Stores at the mere cost of a few pounds of solution of ammonia and of hydrochloric acid, and of a hundred weight of coal and charcoal.

I have tried at various times most of the processes that have been recommended for the extraction of morphia, with the exception of that of Merck,* and I have certainly found no reason to dissent from the preference universally shown by English manufacturers for Gregory's method, taken as a whole, and especially with the proviso above noticed. The substitution by the London College of chloride of lead for chloride of calcium has met with disfavour, partly by reason of the expense of the lead salt, and partly from the large quantity of water required to dissolve it. But I am not sure that a little modification would not remove these objections, and ensure a more abundant yield of morphia. I have been astonished to observe what an exceedingly copious dark precipitate is formed in the opium residues by solution of sugar of lead in Anderson's method, and the great clearing and thinning in the subsequent extract which results; a thinning which, in fact, has the effect of allowing the almost immediate and copious crystallization of one of the constituents, narcein, which otherwise may remain for months in solution. I would propose, then, that after the first evaporation of the watery solution, and the separation of resinous matter by dilution with water, the liquid be precipitated with a saturated solution of acetate of lead, added as long as a deposit is formed. The meconic and sulphuric acids are completely removed, with a great abundance of resinoid substances, but none of the crystalline bases. The liquid is filtered through cloth. To save trouble in washing out the bulky precipitate, the best method would be, after one or two affusions of water, to fold it in calico and squeeze out the liquid in the press and thoroughly dry the precipitate; it may then be powdered, and the soluble matter may be readily extracted by digestion in water. The liquid

* Geiger und Liebig's Handbuch der Pharmacie, Band I. s. 1188.

being now brought to the boiling point, a solution of chloride of calcium, equivalent in quantity to the acetate of lead used, is to be added. On evaporating the filtered liquid to a small bulk, almost the whole of the remaining lead will crystallize out as chloride, after separating which by filtration, the evaporation may be continued until the muriate of morphia crystallizes. The small remaining portion of lead will be effectually got rid of in the final purification with animal charcoal. In this way all the advantages of the use of the lead salt are obtained without the expense and trouble of preparing and dissolving the chloride of lead.

In all the forms of Gregory's process a small portion of the morphia of course remains in solution in the black syrupy residue; it must be eventually extracted by diluting with water and precipitating with ammonia. Mohr's process, which consists in pouring the watery solution of opium into boiling milk of lime (in which the morphia, at first precipitated, speedily redissolves), filtration, evaporation to a small bulk, and precipitation with muriate of ammonia, is admirably adapted to experiments on a small scale, if sufficient time can be allowed for the thorough washing of the lime residue, and for the evaporations. I have generally found that it afforded a better yield of morphia, and in a purer form, than the other methods; but on a large scale it is not suited, I should think, to the appliances of a general laboratory, from the difficulty in boiling such large quantities at once, and in the filtration of the bulky mass of lime and resin.

The mother liquors from the first 300 lbs. of opium after precipitation by ammonia were operated on with the view of obtaining the narcein and meconin. Not being at the time acquainted with the recent researches of Anderson,* I could only consult for this purpose the old papers of Pelletier and Couerbe, their respective discoverers.† The process described was simple in the extreme. Pelletier, in obtaining narcein, treated the mother

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* Trans. Royal Soc. Edin. vol. xx, part iii. p. 347. Liebig und Kopp's Jahresbericht: 1852, s. 537.

† Ann. Chim. Phys. tome L. pp. 240 and 337.

liquors with baryta water to separate meconic acid, and then with carbonate of ammonia to separate baryta; after the requisite filtrations the liquid was evaporated to a syrup, when narcein crystallized after a time, and was obtained by pressing out the liquid through linen. Couerbe, to obtain meconin, omitted the treatment with baryta, and merely evaporated to a syrup, after precipitating the morphia and narcotine with ammonia: after fifteen or twenty days meconin and narcein crystallized together. Since Couerbe obtained both principles by the simpler process, and Pelletier only one by the more complex, I of course adopted the former plan. The liquids were evaporated to a syrup, and set by for a month; nothing however could be found—neither narcein nor meconin. But after standing four months some ounces of small hard brown crystals had formed at the bottom, which turned out to be narcein. Meconin could not be discovered. Acting on the known solubility of meconin in ether, I attempted to obtain it by shaking up the syrupy liquid with ether, and separating and distilling off the ether. There remained a small quantity of what appeared to me to be a resin, and I threw it away. I have no doubt now that it was chiefly meconin. From repeated losses of this kind one becomes at last extremely cautious in throwing away even worthless-looking dregs and residues, and the eloquent words of Sir John Herschel on the use of residues, ever and anon recur to the mind with a full feeling of their force and truth.*

In treating the mother liquors of the last portion of opium, 71 lbs., the method adopted by Anderson was put in practice. The liquid was first diluted with water, and the copious deposit strained off: it was then precipitated with ammonia which threw down, with much resin, morphia, narcotine, thebaia, and a portion of the papaverine. The filtered liquor was neutralized and mixed with solution of sugar of lead in slight excess; after filtering off the very copious dark precipitate, the excess of of lead was removed by sulphuric acid, the sulphate of lead separated, and the acid neutralized by ammonia. The liquid

* Discourse on the Study of Natural Philosophy, § 161, *et ante*: "It was a happy thought of Glauber to examine what every body else threw away."

was now evaporated to a thin syrup. In a few days it appeared semi-gelatinous, owing to the presence of a congeries of very fine silky crystals of narcein. These were separated by filtration and pressure, and recrystallized. The liquid now contained only meconin and papaverine. It was shaken several times with ether, the ether removed and distilled off, and the resinous-looking residue boiled with water, in which it partly dissolved; meconin crystallized on cooling. I could find no papaverine in this substance.

The precipitate by ammonia was boiled with rectified spirit. After cooling, the spirituous liquid, which contained the thebaia with a little narcotine, was separated from the undissolved portion, the spirit distilled off, the residue mixed with a slight excess of acetic acid, and then thrown into a large quantity of cold water. A copious deposit of resin was formed. After filtration, basic acetate of lead was added until the liquid had a faint alkaline reaction. A copious precipitate fell, containing with oxide of lead, resin, narcotine, and papaverine. From the liquid the excess of lead was removed as sulphate by sulphuric acid; after filtration it was nearly neutralized with carbonate of soda, and then treated with solution of ammonia in slight excess. Thebaia, morphia, and resin were thrown down as a light brown precipitate. This was collected, dried, and powdered, boiled with spirit, filtered, the spirit distilled off, and the residue set aside in a capsule for some days. It became filled with crystals of thebaia and morphia. After pressing and recrytallization, the morphia was removed by digestion in solution of caustic soda, and the thebaia purified by solution in acetic acid, digestion with animal charcoal, precipitation with caustic soda, and repeated crystallization out of alcohol.

The precipitate with basic acetate of lead was dried and boiled with spirit, the spirit distilled off, and the cooled residue, after separating the crystals of narcotine, mixed with dilute hydrochloric acid. After some days the hydrochlorate of papaverine ought to have crystallized, but although a few crystals were observed at one time, when I was too busy to attend to them, they disappeared again and could not be reproduced. I therefore varied the proceeding. The liquid was mixed with

twice its volume of spirit, then with excess of caustic soda; ether equal in bulk to the alcohol was now added, and then with agitation water, until the ether separated, carrying with it papaverine and narcotine. The ether was evaporated, and the residue boiled with spirit; crystals of narcotine separated on cooling. The papaverine should now have been in the mother liquor. This was evaporated, and a further crop of small crystals obtained, which were supposed to be the looked-for base. After they had been purified with a great deal of trouble, they weighed 20 grains; they were found however to be nothing but narcotine. I am inclined to think that the failure was owing rather to bad management in some stage of these complicated operations, than to the absence of papaverine in the opium.

The narcein obtained by me corresponded more closely with the description of this substance given by Pelletier than with that by Anderson. It is coloured of a beautiful azure blue by moderately strong sulphuric and hydrochloric acids, as described by the former, though the latter denies the coloration. Strong sulphuric acid dissolves it to a dark brown, almost black solution. I could not obtain the red colour with sulphuric acid, described by Anderson.

Estimation of Morphia.—On this subject an interesting paper was read by Dr. Giraud before the Society in December 1850, in which the advantages of O'Shaughnessy's process, as giving at one and the same operation the proportion, both of morphia and of narcotine, were pointed out. I can upon the whole fully join in the praises bestowed upon this method, but at the same time I have found that in the form practised by the author of that paper it did not quite meet all requirements, especially in regard to the purity of the bases obtained by it. I have been therefore induced to make some little modifications, which I think leave it in a state as nearly perfect as possible. It will be recollected that the principles upon which it proceeds are, 1st, the solubility of narcotine in a sufficient quantity of cold rectified spirit; and 2nd, the strong basic property of morphia, whereby it is capable of decomposing a salt of ammonia, when boiled with it; setting the ammonia free, and combining with its acid. The method of proceeding which I have

found most advantageous is the following: the quantity of opium to be used is immaterial; if sufficient is at hand, 1,000 grains, as recommended by O'Shaughnessy, is a convenient quantity. The opium is broken up into pieces as small as possible, and digested in five times its weight of rectified spirit in a stoppered bottle with occasional agitation for a couple of days. The tincture is strained through calico and pressed, and the marc transferred to a flask, which is to be closed with a stopper or glass plate. The calico is washed with half as much spirit as that first used, which is then digested with the opium for 24 hours more, after which the flask is placed in a water bath, the cork having been removed, until the spirit begins to boil. It is then removed from the bath, and when cool the liquid is strained through calico and thoroughly pressed out, being washed at last with a few drachms of spirit. In this way a complete exhaustion is effected, any remnants of narcotine being brought into solution at the boiling temperature. The liquid, if turbid, is filtered through paper, poured into a retort placed in a water bath, and solution of ammonia, in quantity sufficient to destroy completely the acid reaction, is added. Two drachms will be ample for this purpose; the use of so much as one ounce, formerly recommended, is quite unnecessary. If the spirit is very strong a few drachms of water may be added, and the distillation proceeded with. When four-fifths of the spirit have been distilled off, the retort is removed,* its contents poured into a porcelain capsule, and the retort washed with a small quantity of rectified spirit which is added to the rest. The capsule is covered and left for 24 hours. During the distillation most of the alcohol is driven over, and a weak spirit, much under proof strength remains, in which, when cold, narcotine is scarcely at all soluble. The mass is squeezed through linen, which is better than calico in this case, the crystals of narcotine washed several times with a little rectified spirit, and again pressed.

* It is essential that all the ammonia be driven off, otherwise on the subsequent dilution of the liquid with water some of the morphia will be precipitated with the resin and lost. The last portions of spirit should therefore be tested, and if found alkaline, an additional quantity of pure spirit should be poured into the retort, and the distillation renewed until no more ammonia appears in the distillate.

The liquors are united, and mixed with water equal to four times the weight of the opium employed. After 24 hours the clear liquid is strained off from the deposited resin, gently evaporated to one-fourth of its bulk, the remainder brought nearly to boiling, and mixed in a beaked tumbler with half its bulk of rectified spirit; solution of ammonia is then added until, after blowing away the air in the vessel, the smell of ammonia remains permanently perceptible, or until the air retains an alkaline reaction. In a few minutes flaky crystals of morphia make their appearance, and rapidly increase as the liquid cools. They adhere but little, and sometimes not at all to the walls of the vessel. It is well, at the expiration of 12 hours to stir the liquid smartly, which expedites the complete precipitation of the morphia. After 24 hours the crystals are filtered off, washed, and dried. If they should be very much coloured, which is not often the case, they may be dissolved by warming with a little caustic soda or potash, the liquid diluted, filtered, heated, mixed with alcohol, slightly supersaturated with acid, and precipitated as before by ammonia.

The crystals of narcotine are treated with cold caustic soda or potash of the usual strength; this dissolves the adhering resin, but leaves the narcotine unaffected. After some hours, if the crystals are not quite colourless, the liquid may be heated to 180° for a short time, poured off from the crystals, and the operation repeated with fresh solution of soda, the liquid is then diluted with much water, and the narcotine allowed thoroughly to subside; the clear liquid is then poured off, water added, and the narcotine collected upon a paper filter, washed and dried. The strong alkaline liquid clogs the paper too much to render immediate filtration practicable, hence the necessity of separating it in the first place by the subsidence of the narcotine. The crystals are thus obtained at once and without the trouble and loss of recrystallization, snow-white, notwithstanding the dark colour of the liquid in which they are formed, for the colouring matter is merely superficially adherent; they are also perfectly pure, every trace of morphia being removed by the alkali. The decolorization of morphia is much more difficult, the colouring matter being incorporated with the substance of the crystals; it can only be removed entirely by the use of animal charcoal.

The process, it will be observed, differs from that employed by Sir W. O'Shaughnessy and by Dr. Giraud in the following points:—The extraction of the opium is effected in two macerations instead of one, the last time at a boiling temperature. The quantity of ammonia used is only a third or a fourth of that originally employed. The narcotine is washed with spirit instead of water, the immediate effect of the latter being to throw down quantities of resin upon the crystals in an insoluble form. The narcotine is not dissolved in acid, and reprecipitated by ammonia, which in reality, does very little towards purifying it. I have repeatedly obtained the narcotine by O'Shaughnessy's process as an almost black resinous mass, adherent to the paper and totally devoid of crystallization; it is evident therefore that the results are not fully to be depended on. By the present method the trouble is less, and the result, as may be seen by the specimens on the table, very satisfactory. As to the morphia, the syrupy liquid which contains it is diluted with less water, but I find that the quantity I have mentioned is more than sufficient. Instead of adding the ammonia at once to the cold clear liquid, by which a highly impure and resinous morphia is thrown down, the solution is concentrated, mixed with alcohol, and precipitated hot with ammonia. The spirit keeps the resin in solution, and aided by the effect of heat, retards the separation of the morphia, so that it has time to form distinct crystals. This has been previously pointed out by M. Fordos. The loss of morphia by solution in the spirit is perfectly inappreciable, and is more than compensated by the reduction in the bulk of the liquid by previous evaporation. It is, I believe, an essential step in all precipitations of morphia.

All the processes hitherto recommended had in view merely the estimation of morphia. In addition to the method of Couerbe,[1] commonly known as Mohr's,—and the manufacturing process of Gregory,[2] adopted, but not advantageously, as an analytical one by Berthemot,[3]—may be mentioned that of

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[1] Pereira's Materia Medica, 3rd ed. Vol. II. p. 2107.

[2] Geiger und Liebig's Handbuch der Pharmacie, Band I. s. 1191.

[3] Pereira's Mat. Med. *loco cit.*

Guillermond,[1] who precipitates a spirituous solution at once and without concentration by ammonia, and separates the morphia and narcotine mechanically; or the modification of Riegel,[2] who separates the narcotine from the morphia by treatment with ether; the original one of Robiquet,[3] who precipitates the aqueous solution by boiling with magnesia, dissolves the precipitate in boiling alcohol, and treats the crystals which form on cooling with ether to dissolve narcotine; that of Thiboméry,[4] who precipitates hot with ammonia; that of Fordos,[5] who mixes an aqueous infusion, without previous evaporation, with spirit, and precipitates cold with ammonia, separating the narcotine by washing with ether and chloroform. Lastly, that of Merck,[6] a most trustworthy and practical experimenter, who evaporates the watery infusion to a small bulk, adds an excess of carbonate of soda, continues the evaporation to dryness, washes with water, then with spirit, and treats the residue with very weak acetic acid as long as it is neutralized, which dissolves morphia only and not narcotine; filters through pure animal charcoal, and precipitates with ammonia.

But whatever method is adopted, hurry is to be avoided. The thorough extraction of the opium requires time, and too much time also can hardly be allowed for the crystallization of the morphia; filtrations too are tedious operations, if effectually performed. The use of spirit as the extracting agent is on the small scale much preferable to that of water for all purposes of analysis. It brings into solution all the crystalline principles, including the narcotine, and by leaving undissolved much of the gummy matters, it renders the crystallization and purification more

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1 Journal de Pharmacie, 3me sie. tome XVI. p. 17. Pharmaceutical Journal, Vol. IX. p. 236. Liebig and Kopp's Annual Report for 1849, English edition, p. 422.

2 Pharm. Jour. Vol. XI. p. 418.

3 Ann. Ch. Phys. 2me. sie. tome V. p. 279.

4 Pereira's Mat. Med. *loco cit.*

5 Comptes Rendus, Vol. XXIV. June 15th 1857.—Pharm. Journ. Vol. XVII. p. 289.

6 Geiger und Liebig's Handbuch der Pharmacie, Band I. s. 1188.

easy and complete. By the process above described, I have repeatedly obtained crystals of morphia half an inch and upwards in length, even when operating upon as little as 300 grains of opium. The morphia is separated by this method with fully as much ease and accuracy as by any other, and certainly by no other means can the entire quantity of narcotine be so readily extracted,—a matter of some interest now that the antiperiodic properties of this base are so fully established.

Subjoined are the results obtained by the application of this process to some little known varieties of opium.

No.		Name of Source.	Per Cent. Moisture, dried at 220°.	Smokeable Extract.	Narcotine.	Morphia.	Remarks.
1	Persian.	Shiraz	(about)5·0	62	5·74	5·69	
2	Persian.	Sheereh (from Ispahan).....	(do.) 6·0	80	6·00	7·67	In muller-shaped cakes.
3	Persian.	Pooreh (ditto) ..	(do.) 7·0	84	4·56	4·46	Ditto.
4	Persian.	Kerman	5·46	65	6·58	10·33	
5	Persian.	Kazeroon (from Shiraz)	7·33	78	6·13	6·89	
6	Persian.	Istehbanat (ditto) ..	8·00	73	4·58	6·58	
7	Persian.	Yezd, in sticks	5·30	82	5·89	9·46	In thin sticks, wrapped in coloured paper.
8	Persian.	Do. in lump.....	10·81	50	5·76	5·18	Chick consistence, mouldy.
9	Indian.	Benares, 1850.....	6·33	46 dry.	5·32	3·34	
10	Indian.	Patna, 1850	3 33	53 dry.	4·90	4·53	
11	Indian.	Malwa, 1850	6·00	58 dry.	4·08	5·00	
12	Indian.	Punjab, No. 1.	8·73		3·17	4·44	
13	Indian.	Do. No. 2.	8·67		2·73	9·26	
14	Chinese.	Opium from Canton.	(about)7·0		7·15	4·63	
15	Chinese.	Smokeable Extract, first quality, from Canton. (Qy. Indian opium ?)	19·09	Nearly all soluble in water.	1·30	11·57	Consistence of treacle.

REPLIES TO CERTAIN INQUIRIES FROM THE ROYAL COMMISSION ON THE SANITARY STATE OF THE INDIAN ARMY.

Presented by the Principal Inspector General, Medical Department.

No. 1.—*A list of all the Stations in the Bombay Presidency arranged according to their order of salubrity, with notes on the general Sanitary condition of each.*

The following are the principal Stations for European troops in the Bombay Presidency:—

1. Bombay, and Colaba.
2. In the Deccan.—Poona, Kirkee, Ahmednuggur, Sattara, and Sholapore.
3. In the Northern Division.—Deesa, Ahmedabad, Surat, and Baroda.
4. In the Southern Division.—Belgaum.
5. In Sindh.—Kurrachee, and Hydrabad.
6. In Malwa and Rajpootana.—Mhow, Neemuch, and Nusseerabad.
7. Aden.

It is only since the mutinies that European troops of the Bombay Army have occupied the stations of Mhow, Neemuch, Sattara, Surat, Baroda, and Ahmedabad, and from the two latter places they have been now withdrawn. The statistics of all these new stations, therefore, only extend over three years, whilst at the other places they embrace the period from 1850 to 1860 as will be seen from the accompanying table marked A in the series of tables at the end.

Table A.

Arranged according to their comparative salubrity, as judged of by a minimum of deaths, the several stations stand as follows:—

Stations.	Proportion of Deaths per 1000.	Proportion of treated to strength per cent.	No. of years referred to.
Asseerghur	13·5	152·7	3 Years .. 1858 to 1861
Kirkee	13·7	166·3	10 „ .. 1850 to 1860
Aden	16·7	138·6	„ „ .. ditto.
Poona	17·3	184·2	„ „ .. ditto.
Belgaum	17·8	144·3	„ „ .. ditto.
Sattara	18·9	180·8	3 „ .. 1857 to 1860
Deesa	19·5	185·4	10 „ .. 1850 to 1860
Ahmedabad	20·8	208·8	3 „ .. 1857 to 1860
Sholapore	20·9	245·4	10 „ .. 1850 to 1860
Ahmednuggur	27·2	237·7	„ „ .. ditto.
Kurrachee	27·4	185·6	„ „ .. ditto.
Mhow	28·4	233·3	3 „ .. 1857 to 1860
Hyderabad	28·7	230·6	10 „ .. 1850 to 1860
Neemuch	30·3	279·0	3 „ .. 1857 to 1860
Colaba	32·0	177·5	10 „ .. 1850 to 1860
Nusseerabad	37·8	215·8	„ „ .. ditto.
Baroda	42·3	260·7	3 „ .. 1857 to 1860
Surat	51·7	403·4	„ „ .. 1857 to 1860

European troops were temporarily stationed at, for a short time after the mutinies but have since been withdrawn from, Dharwar, Rutnagherry, Kolapore, Kulludgee, Vingorla, and Malligaum.

No. 1.—Asseerghur.

This is a well-known Hill Fort on the borders of Candeish and Rajpootana. It was formerly garrisoned only by Native troops, but since the mutinies, one or more companies of Europeans have been stationed at Asseerghur. The statistics in the accompanying table* extend over three years from 1858 to 1861, and show that the average annual strength has been 74, of which 112 have been treated in Hospital, being in the proportion of 152·7 per

* No. 1.

cent. The number of deaths has been only one a year, giving a death-rate of 13·5 per thousand. There can be no doubt that it is a very healthy locality for European troops, although the barrack accommodation has been hitherto indifferent. Two new barracks have however been lately erected and occupied. The climate is excellent, moderately dry and not very variable. Fuller details will be found in the separate sanitary report already transmitted.

No. 2.—Kirkee.

Kirkee has been for upwards of a quarter of a century the chief European Cavalry station in the Bombay Presidency. It is now occupied by the Head Quarters of Artillery.

The annual average strength for the last ten years has been 802. The average number of sick 1,335, being in the ratio of 166·3 per cent. of treated to strength; the average number of deaths 11 per annum, being a death-rate of only 13·7, the lowest rate, with the exception of Asseerghur, of any station in the Presidency. The chief diseases, with their classes and numbers, will be seen in the accompanying table.* Cholera it will be observed has visited the station in 1853 and 1855 and last year. The barracks and accommodation for troops are every thing that could be desired. The details with respect to climate and meteorology will be found in the separate sanitary report already transmitted.

* No. 2.

No. 3.—Aden.

This station has been occupied by both European and Native troops of the Madras and Bombay Presidencies, since its capture in 1840. The statistics of European troops for the last ten years furnish the following results. The average annual strength, consisting of a wing of one of the line or local Regiments with a company of Artillery, has been 479, the average number of sick treated has been 664, and the average number of deaths 8. This gives, therefore, an amount of sickness of only 138·6 per cent. being one of the lowest of any station in the

Presidency, and a death-rate of only 16·7 per mille. The principal classes of disease will be seen in the accompanying table.* Cholera, it will be observed, was altogether absent from Aden. The barrack accommodation for the troops is on the whole good, and additional barracks are about to be erected.

* No. 3.

No. 4.—Poona.

Is a well-known station for European troops in the Deccan, within a few hours' reach of Bombay and of the sea coast by rail.

The average annual strength of European troops, consisting of Horse Artillery and Infantry, has been 2,191, of which number the admissions into hospital average 4,037, being at the rate of 184·2 per cent. The average yearly number of deaths has been 38, giving a death-rate of 17·3 per thousand. The chief classes of disease will be seen in the accompanying table.* Cholera, it will be observed, has been epidemic last year, and in some former years. Weak and delicate Soldiers and invalids are sent to the neighbouring Sanatarium of Poorundhur, which is easily accessible, and those requiring the air of the sea coast, to the Colaba Sanatarium. The new barracks, hospitals, and appliances for troops at this station, are of a superior description. The barracks have been made as comfortable and salubrious as possible, and are a great contrast to the old ones.

* No 4.

No. 5.—Belgaum.

This has always been a favourite station for European troops in the Southern Division. During the last ten years, the average yearly strength of European troops has been 1,286, consisting of Artillery and Infantry;—the average number of sick yearly treated has been 1,856, being in the proportion of 144·3 per cent. The number of deaths has been annually 23 on an average of ten years, making the death-rate 17·8 per mille.

The principal classes of disease will be seen from the accompanying table;* and it will be observed that with the exception of last year, epidemic cholera has been almost entirely absent from the station for the past ten years. The barracks and accommodation for troops are of a superior description, and the camp is well drained. This station is 2,500 feet above the level of the sea, the climate partaking in some degree of both the N.E. and S.W. monsoons, and very agreeable to the European Soldier.

* No. 5.

No. 6.—Sattara.

Sattara has only been occupied by European troops since the mutinies, and the accommodation has been of the most temporary nature. A site for permanent barracks has been chosen contrary to the recorded opinion of the present Deputy Inspector General of Hospitals of the Poona Division.

The statistics only extend therefore from the year 1857 to 1860. The average strength of Artillery and infantry has been 369, whilst the admissions into hospital have been 667, or about 180·8 per cent., the average annual number of deaths has been seven, showing a low death-rate of only about 19 per mille (18·9).

Table No. 6.

No. 7.—Deesa.

At Deesa, European troops have been long stationed, usually one troop of Horse Artillery and a wing, or an entire European Regiment. During the last ten years the average annual strength has been 769, and the treated in hospital 1,426, being in the proportion of 185·4 per cent. to strength. The annual average number of deaths has been 15, giving a death-rate of 19·5 per mille. The chief diseases are fevers, peculiar to Gujarat, from which the mortality is high, but has been reduced somewhat by the severe cases, which would admit of it, being sent to the neighbouring Sanatarium at Mount Aboo. The accompanying table* will show the chief diseases from which the troops suffer.

* No. 7.

No. 8.—Ahmedabad.

This station was only occupied by European troops since the mutinies in 1858, 1859, and 1860, and they are now withdrawn with the exception of a company of Artillery.

The barracks were only of a temporary nature, but there is good and sufficient accommodation for the Artillery. During the three years under report the average annual strength was 670, the average sick treated, per annum was 1,399, being in the proportion of 208·8 per cent. The annual number of deaths was 14, in the ratio of 20·8 per mille.

Table No. 8.

No. 9.—Sholapore.

A company of European Artillery has been stationed at Sholapore as a portion of its regular garrison during the last ten years, but between the years 1857 and 1860, detachments of Infantry were located there, which have however now been withdrawn. The average annual strength has been 143, the number of sick treated has been 351 per annum, being in the proportion of 245·4 per cent. The average yearly number of deaths has been 3, making the mortality rate 20·9 per mille. The chief classes of disease will be seen by the accompanying table.* Even if it were desirable to locate a larger body of European Troops at Sholapore than at present, there would not be sufficient accommodation, although the facility of easy access by rail makes it otherwise a convenient position.

* No. 9

No. 10—Ahmednuggur.

This, although a favourite station and for many years the Head Quarters of the Bombay Artillery, has been far from a healthy location for troops, as must be evident from it being placed *tenth* on the present List. The average annual strength has been 440, whilst the admissions and treated in hospital have amounted to 1,046 per annum, in the proportion of 237·7 per cent.

The number of deaths has averaged 12 per annum, making the death-rate 27·2 per mille. At Ahmednuggur the high rate of sickness is due chiefly to the arrival of recruits from England and to their being located there during the period of acclimatization. The barracks, hospital, and accommodation, are all of a comparatively old date.

Table No. 10.

No. 11.—Kurrachee.

During the last ten years the average annual number of troops at Kurrachee has been 1,566, consisting generally of one troop of Horse Artillery, a company or more of Foot Artillery, and a full Regiment of Infantry. The number, however, has been augmented by troops proceeding to, or arriving from, the Upper Provinces of India, and halting at Kurrachee, until their arrangements were completed. There were 2,907 patients treated annually in hospital, being in the proportion of 185·6 per cent. The annual average mortality was 43, showing a death-rate of 27·4 per mille. The number of deaths from the chief classes of disease is shown in the accomp anying table.* Cholera, it will be observed, prevailed in 1853, 1854, and last year, to a very considerable extent. The new barracks at Kurrachee are superior to any other except at Hydrabad in Scind.

* No. 11.

No. 12.—Mhow.

The station has for some years previous to the mutinies been occupied by Bengal troops. It is only since 1857 that a portion of the Bombay Army has garrisoned it, and hence the statistics embrace only the three last years. The troops quartered at Mhow have consisted at different times of Horse and Foot Artillery, of Cavalry, and of Infantry. The annual average strength of all arms has been 983. The number treated in hospital 2,295 per annum, being in the proportion of 233·3 per cent. The average annual number of deaths was 28 giving a death-rate of 28·4 per mille.

Table No. 12.

The barracks and accommodation for European troops have hitherto not sufficed, and were of a temporary nature; but new permanent barracks of a superior description are now ready.

No. 13.—Hydrabad in Sind.

Portions of different arms of the service have occupied Hydrabad during the last ten years, but the strength has varied greatly from 905 in 1856, to 52 in 1857. In the former year the whole of the 2nd European Regiment was stationed at Hydrabad previous to the Persian campaign. The average yearly strength has been 418, and the average yearly number of patients treated in hospital 964, being in the proportion 230·6 per cent., chiefly, as it will be observed from the accompanying table,* from fevers. But the number of deaths was only 12 per annum, making the annual death-rate about 28·7 per mille. During the decade under notice, not a single instance of admission or of death from cholera took place. The barracks for European troops at Hydrabad surpass any other, upon this side of India, for loftiness and airiness.

* No. 13.

No. 14.—Neemuch.

This Station has been occupied by Native troops of the Bombay Army for a long time, but only since 1857 have European troops formed a portion of its garrison. These have consisted of Artillery, Infantry, and few squadrons of Cavalry. The barracks occupied by European troops were the best that could be restored and re-constructed out of the hospitals and other buildings formerly appropriated for Natives.

The mean annual strength of the last 3 years was 658, of these 1,836 were treated in hospital, being in the proportion of 279·0 per cent. The average annual deaths were 20, giving a death-rate of 30·3 per mille.

Table No. 14.

No. 15.—Bombay and Colaba.

The average annual strength of European troops at Colaba and in Bombay, appears by the tables to be 818 per annum, but this is fallacious, as the garrison merely consists of a wing of a European Regiment and a company of Artillery. The additional numbers are made up by the arrival of troops, chiefly invalids, for embarkation to England, and by drafts proceeding up country. In this way invalids arrive very often only to increase the sick list, and to swell the high death-rate of Bombay which, for the decade 1850 to 1860, reached as high as 32 per mille. This state of things will not probably again happen, as the establishment of the Khandalla Depôt relieves Bombay of invalids; whilst the railroad to Poona permits invalids from that large station being kept in their own hospitals until the eve of embarkation still, there is no doubt but that Bombay is a very unhealthy station, both for European and Native troops. Very severe epidemics of fever prevailed in 1858 and in the present year, owing to the bad structure of barracks and hospitals, insufficient drainage, and unwholesome effluvia from the neighbouring beach.

Table No. 15.

No. 16.—Nusseerabad.

Between the years 1850 and 1857 only one company of European Artillery belonging to the Bombay Presidency was stationed at Nusseerabad, and even this company was withdrawn in the early part of 1857. But since that period, in addition to a troop of Horse Artillery, some portion of a Dragoon Regiment and a wing or more of Infantry have occupied Nusseerabad. During the first seven years of the decade, the average annual strength was about 60, but for the whole period of ten years the average yearly strength amounts to 449, and the treated in hospital to 969 or 215·8 per cent. The number of deaths was 17, which, in proportion to the strength, makes the death rate 37·8 per mille. The accompanying tables show the chief forms of disease met with at Nusseerabad.

Table No. 16.

No. 17.—Baroda.

This Station was temporarily occupied by European Troops from 1857 to 1860, but it has since been given up. A Battery of Royal Artillery with a few companies of an Infantry Regiment, formed its garrison, the annual average strength of which was about 354. Of this number the treated in Hospital amounted to 923, being in the proportion of 260·7 per cent. The annual mean mortality was 15, being at the rate of 42·3 per mille. This large mortality was due to a peculiar form of "*sun-stroke*" which with "*apoplexy*" carried off 21 individuals out of the total number of deaths (45).

Table No. 17.

The barracks and accommodation were merely temporary.

No. 18.—Surat.

A few European troops have been quartered in the Fort at Surat since the mutinies, and continue to be so located, although the sickness and mortality have been greater than at any other station in the Bombay Presidency as the following table will show. The strength of the detachment was annually 58, the number of admissions and treated in hospital 234, being more then 400 per cent., whilst the deaths averaged 3 per annum, in the proportion of 51·7 per mille. Out of the total number of deaths, viz., nine in the (3) three years, six occurred from diseases of the stomach and bowels, diarrhœa or dysentery. The Castle at Surat has been always considered unhealthy and the room used as a guard-room unfit to be occupied by European Soldiers; whilst the drain is occasionally very offensive.

Table No. 18.

No. 2.—A list of all existing Sanataria in the Bombay Presidency, with an account of the advantages or disadvantages of each.

(1) *As places of residence for preserving health.*

(2) *As places of recovery from sickness, with diseases for which they are adapted, or not adapted.*

Existing Sanataria.

The existing Sanataria are,—

1. Mahableshwur.
2. Poorundhur.
3. Mount Aboo.
4. Ghizree.
5. Taraghur.
6. Sulabat Khan's Tomb, near Ahmednuggur.

1. Mahableshwur is situated on the western slope of the table land of the Ghâts 17° 56″ N. lat. 73° 30″ E. long. and is 4,500 feet in height at its highest point. The climate is very pleasant, the annual mean temperature being 66° Fah., the mean range 9·7. The air is moist from the influence of the sea breeze which reaches the hill in full force, and preserves it from the aridity so common on the hills further eastward from the coast.

Mahableshwur is not made use of as a Sanatarium for troops in the Deccan, as it is unsuitable during the monsoon from the amount of rain which falls, the average being upwards of 250 inches. Invalids would have to descend to the plains in the hottest period of the year, and at a season when cholera generally prevails; so that this hill is not calculated either as a place of recovery for the sick, or as a permanent residence for persons in health.

In the year 1829, a party of invalid soldiers was sent to this Sanatarium, but the results did not warrant the experiment being repeated. Since that period it has been resorted to chiefly in the hot months of October and November, April and May, as a hill station to escape the heats of the plains. Since the introduction of the New Furlough Regulations few Officers are sent to Mahableshwur for any continued period, or for any serious

chronic disease, as a change to England has a more beneficial and enduring effect, than a resort to any hill station in the Tropics.

A full account of the medical topography and meteorology of the Mahableshwur Hills will be found in the 1st, 2nd, and 7th Nos. of the Transactions of the Medical and Physical Society of Bombay (copies of which are obtainable at the India House), and in Dr. Morehead's published reports on the Sanataria of Western India (*see Morehead's Researches on Disease in India, new edition, page* 728).

II. Poorundhur has for the last eight or nine years been used as a Sanatarium for troops in the Deccan. During that time about 2,000 invalids have been treated on the hill, 1,500 have been cured and returned to duty, 29 only have died, and the remainder were either returned to the plains—the climate being unsuited to their complaints—or are now occupants of the Sanatarium.

Its height is about 4,200 feet above the level of the sea, its climate is cool and invigorating, it is within the influence of the sea breeze, and the fall of rain, about 70 inches, is not so heavy as to render it uninhabitable the whole year.

Poorundhur, like all the hills arising from the plain on this side of India, is not useful in cases of organic disease, but those from debility, fever, dyspepsia, derive great benefit. There is not space at Poorundhur for a cantonment for troops in health, but it is most useful as a Sanatarium.

A full description of Poorundhur will be found in a memorandum published by Dr. Morehead at page 747 of the 2nd edition of his Researches, and a later Bombay account in the appendix to the sixth volume of the Bombay Medical and Physical Society's Transactions.

Annual Returns of Mortality and Sickness are herewith appended.

III. Mount Aboo is situated in the territories of the Rao of Sarowy in Rajpootana, 50 miles N.E. from Deesa, the principal station for European troops in Guzerat. It is in 72° 50″

E. long. and 24° 37″ N. lat. and is about 4,500 feet in height. Aboo has been resorted to for the last twenty years, as an agreeable retreat in the hot weather, and since 1851, European invalids have been located there; the climate is cool and favourable for Europeans, the scenery is picturesque and the sites for building are very eligible. Troops remain on the hill the entire year, and Mount Aboo is therefore not only fitted as a Sanatarium for Invalids suffering from the debility of fever, induced on the plains of Guzerat, but from the ample space and excellent climate it is well adapted for a permanent station for European soldiers. The barracks have been placed in a disadvantageous position which, however, is about to be changed.

A general topographical and medical report by Assistant Surgeon Ogilvy up to the latest date, will be found in the sixth Volume of the Bombay Medical and Physical Society's Transactions, page 192.

The annual return of sickness and mortality for the last ten years accompanies this paper.

IV. Ghizree is not a hill, but a coast Sanatarium, and as such has been for some years occupied by the troops in Sindh. It is elevated scarcely 60 feet above the level of the sea, but the plateau rises abruptly from the shore and enjoys in an eminent degree the full force of the sea breeze, pure and uncontaminated, from the Indian ocean. It is in the purity of the air, the strength of the breeze, and consequently slightly lower temperature than the camp of Kurrachee, that the value of Ghizree as a sanatarium consists, and a residence there is calculated to give a healthy tone to the weakened system, whether arising from fever or from chronic visceral disease.

Ghizree is not at all fitted for a permanent encampment for a large body of troops, owing to the want of water of which it is entirely destitute, as all required at the sanatarium is brought from the cantonment of Kurrachee.

A further account of Ghizree will be found at pages 15 and 16 of the published report on the extent and nature of the Sanitary Establishments, in the selections from the records of the

Government of India (Military Department) Calcutta, March 1861.

Tables of Sickness and Mortality are herewith appended.

V. Taraghur is a hill fort about 14 miles from Nusseerabad, close to Ajmere, which has been made use of as a hill Sanatarium and with great success; the ascent is easy, but the space on the plateau is not sufficient for more than 40 or 50 invalids. The hill is 2,800 feet above the sea, and about 1,000 above the plain: water is collected in tanks and supplies are abundant.

The statistics do not extend beyond the present year. From April 1860 to March 1861, 178 invalids have been sent to the hill for change of air, of these only 14 were returned without having derived any benefit; no death occurred, the cases were however well selected and the experiment has proved that men suffering from debility, the result of sickness and long confinement in hospital, recover rapidly at Taraghur.

VI. Salabat Khan's Tomb, near Ahmednuggur, has lately been resorted to as a Sanatarium for weekly and delicate Soldiers from Ahmednuggur during the hot months of April and May. It it a small hill about 6 miles from Ahmednuggur, about 2,000 feet above the level of the sea, and 6 or 700 feet above the level of the camp of Ahmednuggur. The temperature is about 2 or 3 degrees cooler than Ahmednuggur. It is freely exposed to the high winds which prevail during the hot months in the Deccan, but on the hill these are cool, whilst in cantonment a furious hot wind may be blowing.

The tomb has received certain additions and improvements since it was first occupied in 1859, and the buildings are now well adapted for the reception of invalid Europeans, about 50 or 60 men have been sent there during the hot season with advantage and improvement to their general health. The site from its elevation is cool and healthy, and recent experience proves that a temporary residence is very beneficial to Soldiers in a debilitated condition. There is ample space for the erection of other buildings, but the access is not good and water is not obtainable on the hill, but from a distance.

No. 3.—*A list of all places within the Bombay Presidency where Hill stations might be advantageously fixed for the health of the Troops, or where Sanataria might be established, with particulars as to the elevation, topography, climate, means of access, distance from Stations, &c.*

There are many hills met with in the Ghâts and spurs leading from them, well calculated for Sanataria, and where hill stations might be advantageously fixed, if they were accessible. These hills are generally about 4,000 feet above the level of the sea, and enjoy the same climate as Mahableshwur, but are for the most part inaccessible, deficient of supplies, and out of the line of the railroad. In the Satpoora range in Kandeish there are also hills varying from 4,000 to 6,000 feet in height, and one of these would probably be found very useful to the troops serving in Malwa who have as yet no nearer resort for Invalids than Poorundhur which entails a long and wearisome march of 350 miles.

The general height of the most elevated hills in this Presidency seldom exceeds 4,000 feet, in one instance alone in Kandeish is there a mountain of 6,000 feet, but the plain surrounding it is said to be very unhealthy.

Between Sattara and Mahableshwur the hill of Euteshwur possesses great advantages, and is likely to prove a good locality for preserving the health of troops. Its height is 3,600 feet with good water, soil, and plenty of space as well as easy of ascent.

As places of residence for preserving the health of European Troops, there is no want in the Bombay Presidency.

One of these, Paunchgunny, 12 miles to the eastward of Mahableshwur, is sheltered from the monsoon. The fall of rain is so slight as to be of no inconvenience, the average being about 50 inches per annum. Troops might reside at Paunchgunny the whole year, the soil is laterite and water does not remain on the surface. The sea breeze, although late in arrival, blows regularly for many hours in the day. There is ample space for drill, and the climate is favourable for horticultural

pursuits. Its mean maximum temperature is 77° and mean minimum 62°, whilst the extremes are from 56° to 86°. It is perfectly accessible.

An account of Paunchgunny will be found in Dr. Morehead's Note on Deccan Hill Climates before referred to.

The Sanataria in this Presidency are generally free from malarious fever; neither does the climate produce abdominal complaints as noticed at the Hill stations of Bengal.

There are two coast Sanataria for such diseases as hill climates do not suit,—one at Colaba, the other at Rairee, on the Southern Mahratta Coast, near Belgaum.

Colaba, although a convenient locality, is unhealthy, and it is to be hoped that some more pure and salutiferous site will be ere long selected on the coast of the Concan.

Rairee is only now being tried and as yet the results are not known.

TABLES

OF THE

HEALTH STATISTICS OF THE STATIONS FOR EUROPEAN TROOPS IN THE BOMBAY PRESIDENCY.

TABLE A.

GENERAL RETURN of the Health Statistics of the Stations for European Troops in the Bombay Presidency.

Period.	Number of years.	Stations.	Strength	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Diseases of the Liver.		Diseases of the Stomach and Bowels.		Diseases of the Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	Ratio per 1,000 to average Strength.
				Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
From 1858 to 61	3	Asseerghur	223	106	..	..	..	26	..	8	1	16	..	5	1	1	..	179	..	341	3	152·7	13·5
,, 1850 to 60	10	Kirkee	8,026	3,919	23	13	..	701	13	839	9	1,923	40	283	7	24	11	6,150	9	13,352	112	166·3	13·7
,, ditto	10	Aden	4,794	1,470	17	..	..	394	13	326	12	1,138	11	260	11	..	..	3,055	16	6,643	80	138·5	16·7
,, ditto	10	Poona	21,911	12,596	38	58	6	1,771	51	1,284	48	4,970	106	902	18	111	58	18,684	54	40,376	379	184·2	17·3
,, ditto	10	Belgaum	12,866	3,208	18	22	5	1,104	19	835	24	2,490	91	556	20	31	22	10,323	36	18,569	235	146·6	17·8
,, 1857 to 60	3	Sattara	1,106	884	1	6	1	48	1	31	..	209	4	56	2	19	11	787	..	2,000	20	180·8	18·9
,, 1850 to 60	10	Deesa	7,698	4,773	38	19	2	741	15	615	12	1,589	38	291	26	21	11	6,214	19	14,263	161	185·2	19·5
,, 1857 to 60	3	Ahmedabad	2,012	2,204	19	..	..	189	4	78	4	483	4	41	9	3	2	1,201	1	4,199	43	208·6	20·8
,, 1850 to 60	10	Sholapoor	1,437	1,963	8	4	..	101	..	80	2	313	11	32	1	21	10	994	2	3,508	34	244·1	20·9
,, ditto	10	Ahmednuggur.....	4,396	3,482	11	24	3	581	16	179	8	1,715	46	349	3	50	32	4,080	9	10,460	122	237·9	27·2
,, ditto	10	Kurrachee	15,665	10,367	90	5	..	1,493	56	996	44	4,266	128	818	35	53	26	11,072	55	29,070	434	185·5	27·4
,, 1857 to 60	3	Mhow	2,950	3,100	18	4	..	252	4	158	12	855	16	68	9	36	16	2,412	9	6,885	84	233·3	28·4
,, 1850 to 60	10	Hydrabad	4,181	4,706	56	..	..	256	11	274	7	1,000	26	294	19	..	..	3,112	7	9,642	126	230·6	28·7
,, 1857 to 60	3	Neemuch	1,974	3,299	21	8	1	175	3	136	11	412	12	43	5	..	..	1,435	7	5,508	60	279·0	30·3
,, 1850 to 60	10	Bombay & Colaba..	8,183	4,506	24	11	3	548	25	582	37	2,562	88	348	18	76	35	5,895	32	14,528	262	177·5	32·0
,, ditto	10	Nusseerabad	4,495	3,538	51	32	2	269	10	224	15	1,054	47	204	30	15	3	4,360	11	9,696	169	215·7	37·8
,, 1857 to 60	3	Baroda	1,062	1,733	10	..	..	106	4	35	2	210	1	61	21	7	5	617	2	2,769	45	260·7	42·3
,, ditto	3	Surat.....	176	446	2	2	..	15	..	17	..	88	6	16	1	2	..	118	..	704	9	400·0	51·7

No. 1.—ASSEERGHUR.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Diseases of the Liver.		Diseases of the Stomach and Bowels.		Diseases of the Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1858-59.	Detacht. H. M.'s 18th Ryl. Irish..	80	55	..	..	..	18	..	2	..	3	..	..	..	..	..	80	..	158	..	197·5	..
	„ „ 57th Regt.....																					
1859-60.	„ „ 18th Ryl. Irish..	89	40	..	..	..	8	..	4	..	8	..	2	..	1	1	65	..	128	1	143·8	1·1
	„ „ 28th Regt.....																					
1860-61.	„ „ 28th Ditto	74	11	..	..	..	..	..	2	1	5	..	3	1	..	..	34	..	55	2	74·3	2·7
	„ „ 95th Ditto																					
	Total....	223	106	..	..	..	26	..	8	1	16	..	5	1	1	1	179	..	341	3	152.9	1·3

No. 2.—KIRKEE.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Diseases of the Liver.		Diseases of the Stomach and Bowels.		Diseases of the Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1850-51 ..	H. M.'s 8th Hussars	680	286	2	..	..	128	3	72	1	309	17	9	1	..	..	755	1	1,559	25	229·2	3·6
1851-52 ..	,, ditto	702	436	6	..	..	103	3	35	..	300	4	3	1	..	..	657	1	1,534	15	218·5	2·1
1852-53 ..	,, ditto	705	664	1	3	..	68	1	33	..	254	1	3	..	..	..	668	1	1,693	4	240·1	0·5
1853-54 ..	,, ditto	691	681	4	..	..	57	..	19	..	195	..	6	..	10	7	630	..	1,598	11	231·3	1·5
1854-55 ..	,, ditto	662	395	1	1	..	31	1	24	2	165	4	9	1	..	..	422	2	1,047	11	158·1	1·6
1855-56 ..	,, 14th Light Dragoons.	720	275	2	1	..	23	1	33	..	64	1	17	..	6	1	606	1	1,025	6	142·3	0·8
1856-57 ..	,, ditto	686	137	1	1	..	16	1	25	..	60	1	24	1	1	..	429	..	693	4	101·0	0·9
1857-58.	,, 3rd Dragoons	967	120	..	1	..	66	..	27	3	71	..	6	..	..	..	353	..	644	3	66·5	0·3
	,, 14th Light Dragoons.																					
	,, 17th Lancers																					
1858-59.	,, 3rd Dragoons	1,014	533	5	3	..	86	..	24	1	216	5	155	2	..	..	750	2	1,767	15	174·2	1·4
	,, 6th ditto																					
	,, Depôt 14th Light do.																					
	,, 17th Lancers																					
1859-60.	,, 6th Dragoons	1,199	392	1	3	..	123	3	47	2	289	7	51	1	7	3	880	1	1,792	18	149·4	1·5
	,, 14th Light ditto....																					
	Total....	8,026	3,919	23	13	..	701	13	339	9	1,923	40	283	7	24	11	6,150	9	13,352	112	166·3	1·3

No. 3.— ADEN.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the								Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
							Lungs.		Liver.		Stomach and Bowels.		Brain.									
			Treated.	Died.	Treated	Died.	Treated.	Died.	Treated.	Died	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1850-51	H. M.'s 78th Highlanders	501	184	4	..	..	7	3	81	4	67	1	7	3	..	..	263	1	609	16	121·5	3·1
1851-52	,, ditto	483	89	1	..	..	14	2	22	..	147	1	10	..	..	..	193	2	475	6	98·3	1·2
1852-53	,, ditto	400	87	2	..	..	43	..	29	1	123	1	6	..	..	..	229	3	517	7	129·2	1·7
1853-54	Wing 86th Regiment	458	174	1	..	..	53	2	32	1	157	..	13	1	..	..	270	1	699	6	152·6	1·3
1856-57	,, ditto	456	58	1	..	..	106	..	25	..	101	..	13	..	..	..	244	..	547	1	119·9	0·2
1857-58 ..	,, 57th ditto	286	53	..	..	..	14	1	3	..	35	..	2	..	..	..	91	..	198	1	69·2	0·3
	,, 86th ditto																					
1858-59 ..	2-11 Royal Artillery.....	311	261	2	..	..	19	2	10	1	53	2	3	1	..	..	141	1	487	9	156·6	2·9
	Wing H. M.'s 57th Regt.																					
1859-60 ..	5-13 Royal Artillery.....	322	67	1	..	..	12	..	10	..	54	..	9	..	..	..	203	..	355	1	110·2	0·3
	R. W. H. M.'s 4th K. O. Regt.....																					
	Wing H. M.'s 57th Regt.																					
	European Troops of the Indian Army.																					
1852-53	Hd. Qrs. 1st Eur. Regt. Fus.....	132	46	..	..	..	10	..	9	..	23	..	19	..	..	..	177	..	284	..	215·1	..
1853-54	,, 1st ditto	513	218	1	..	..	34	..	47	1	131	3	75	3	..	..	450	..	955	8	186·1	1·5
1854-55 ..	2nd Co. 1st Battalion Artillery....	516	133	2	..	..	38	3	49	2	122	..	72	2	..	..	527	4	941	13	182·3	2·5
	Hd. Qrs. 1st Eur. Regt. Fus.....																					
1855-56 ..	2nd Co. 1st Battalion Artillery ..	178	64	1	..	..	12	..	7	2	65	3	17	1	..	..	127	1	292	8	164·0	4·5
	Hd. Qrs. 1st Eur. Regt. Fus.....																					
1856-57	2nd Co. 1st Battalion Artillery	102	23	..	..	..	30	..	1	..	44	..	5	..	..	..	63	1	166	1	162·7	0·9
1857-58	Ditto	94	10	1	..	..	2	..	..	..	11	..	5	..	..	..	46	2	74	3	78·7	3·2
1858-59	Ditto	42	3	..	..	..	..	..	1	..	5	..	4	..	..	..	31	..	44	..	104·7	..
	Total....	4,794	1,470	17	..	..	394	13	326	12	1,138	11	260	11	..	..	3,055	16	6,643	80	138·5	1·6

No. 4.—POONA.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers		Diseases of the								Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
							Lungs.		Liver.		Stomach and Bowels.		Brain.									
			Treated	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1850-51 ..	H. M.'s 83rd Regiment	1,117	340	2	1	..	90	1	39	..	392	21	21	..	1	..	863	2	1,747	26	151·4	2·3
	,, 86th ditto																					
1851-52	,, ditto	1,089	450	1	1	1	79	..	73	..	312	5	29	2	..	..	847	2	1,791	11	164·4	1·0
1852-53 ..	,, 78th Highlanders	1,252	401	..	1	..	98	2	83	4	308	2	31	..	..	..	868	1	1,790	9	142·9	0·7
	,, 86th Regiment																					
1853-54 ..	,, 78th Highlanders	1,831	1,514	3	5	1	182	2	203	6	499	4	54	1	1	..	1,249	7	3,707	24	202·4	1·3
	,, 86th Regiment																					
1854-55	,, 78th Highlanders	921	754	1	12	2	64	4	107	3	169	1	26	2	1	..	523	7	1,656	20	179·8	2·1
1855-56	,, ditto	878	463	2	4	..	42	3	52	..	115	..	26	..	..	..	471	2	1,173	7	133·5	0·7
1856-57	,, ditto	768	173	..	1	..	37	..	56	2	117	3	27	3	5	4	433	2	849	14	110·5	1·8
1857-58 ..	D. Troop Royal Artillery	1,076	404	3	6	..	81	4	17	2	126	1	22	..	..	..	596	2	1,252	12	116·3	1·1
	8 | 14 ditto																					
	H. M.'s 18th Royal Irish.....																					
	,, 33rd Regiment																					
	Depôt H. M.'s 78th Highlanders ..																					
	,, ,, 86th Regt.....																					
1858-59 ..	D. Troop Royal Artillery	3,049	1,480	3	6	..	222	4	58	4	376	7	43	2	1	..	1,858	1	4,044	21	132·6	0·6
	Detacht. 8 | 13 ditto																					
	Y. F. B. ditto																					
	H. M.'s 18th Royal Irish																					
	,, 31st Regiment.....																					
	,, 33rd ditto																					
	Depôt H. M.'s 78th Highlanders ..																					
	,, ,, 86th Regt.																					
	German Legion.....																					

1859-60	1 13 Royal Artillery 3 13 ditto 7 13 ditto 11 Co. Royal Engineers H. M.'s 31st Regiment ,, 57th ditto German Legion	1,757	1,175	3	1	1	78	4	65	4	299	19	31	1	40	26	1,325	2	3,014	60	171·5	3·4
	European Troops of the Indian Army.																							
1850-51	2nd Troop Horse Brigade 3rd ditto 4th ditto 1st European Regt. Fusiliers	1,386	1,440	9	3	..	97	4	106	5	261	10	126	3	14	4	1,565	2	3,612	37	260·6	2·6
1851-52	2nd Troop Horse Brigade 3rd ditto 1st European Regt. Fusiliers	1,305	612	..	5	1	104	5	110	3	210	8	139	1	1	1	1,351	4	2,532	23	194·0	1·7
1852-53	2nd Troop Horse Brigade 3rd ditto 1st European Regt. Fusiliers	1,020	704	..	..	..	125	3	79	..	170	5	196	..	..	..	1,276	4	2,550	12	250·0	1·1
1853-54	2nd Troop Horse Brigade 3rd ditto 3rd European Regiment	560	162	..	..	..	38	2	16	1	115	1	17	1	2	2	423	1	773	8	138·0	1·4
1854-55	1st Troop Horse Brigade 2nd ditto 3rd ditto 3rd European Regiment	840	651	3	3	..	161	2	40	2	411	6	12	..	7	7	939	5	2,224	25	264·7	2·9
1855-56	Horse Brigade 3rd European Regiment	1,051	830	2	2	..	72	3	45	1	448	3	34	1	..	..	1,425	1	2,856	11	271·7	1·0
1856-57	Horse Brigade 3rd European Regiment Station Staff	1,035	521	4	2	..	80	..	59	4	266	..	28	..	8	3	1,224	3	2,188	14	211·4	1·3
1857-58	Horse Brigade 1st Co. 2nd Battalion Artillery 3rd ,, 2nd ditto 4th ,, 2nd ditto 3rd European Regiment Station Staff	505	226	1	..	..	51	2	36	4	177	3	15	1	..	..	912	2	1,417	13	280·5	2·5
1858-59	Horse Brigade Depôt 3rd European Regiment Station Staff	177	129	1	5	..	26	1	17	1	71	4	6	..	..	..	247	2	501	9	283·0	5·0
1859-60	Horse Brigade Station Staff	294	167	..	..	..	44	5	23	2	128	3	19	..	30	11	289	2	700	23	238·0	7·8
	Total....	21,911	12,596	38	58	6	1,771	51	1,284	48	4,970	106	902	18	111	58	18,684	54	40,376	379	184·2	1·7

No. 5.—BELGAUM.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Diseases of the Liver.		Diseases of the Stomach and Bowels.		Diseases of the Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated	Died.	Treated.	Died	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1853-54	H. M.'s 64th Regiment	332	247	..	4	2	34	..	22	..	58	2	20	..	..	..	383	1	768	5	231·3	1·9
1854-55	,, ditto	992	231	..	1	..	128	1	88	1	223	11	46	1	..	..	947	..	1,664	14	167·7	1·4
1855-56	,, ditto	1,093	192	1	2	..	69	2	81	2	244	9	37	..	..	..	870	4	1,495	18	136·7	1·6
1856-57	,, ditto	664	107	..	..	..	63	..	83	1	170	10	54	3	..	..	610	2	1,087	16	163·7	2·4
1857-58 ..	8 | 14th Royal Artillery ..... Detacht. H. M.'s 3rd Dragoons.... H. M.'s ,, 33rd Regiment.... H. M.'s ,, 56th ditto .... Depôt H. M.'s 64th ditto .... H. M.'s 86th ditto	866	95	1	3	1	46	..	29	1	119	2	15	1	..	..	397	1	704	7	81·3	0·8
1858-59 ..	,, 56th ditto .... Depôt H. M.'s 64th ditto	664	174	2	..	..	101	1	52	2	210	3	21	..	..	..	755	1	1,313	9	197·0	1·3
1859-60 ..	H. M.'s 56th ditto .... ,, 83rd ditto	1,090	171	1	..	..	85	..	59	2	230	9	19	3	16	14	851	3	1,431	32	131·3	2·9
	European Troops of the Indian Army.																					
1850-51 ..	2nd Regiment European L. I. .... Garrison Details.....	1,059	293	4	..	..	118	3	77	4	240	8	31	2	1	..	1,113	3	1,873	24	176·8	2·2
1851-52 ..	3rd Co. 1st Battalion Artillery .... 2nd Regiment European L. I. .... Garrison Details.....	1,249	287	3	..	..	125	5	79	..	216	6	72	2	1	1	1,105	4	1,885	21	150·8	1·6

1852-53 ..	3rd Co. 1st Battalion Artillery .... 2nd Regiment European L. I. .... Garrison Details	1,163	323	1	3	1	157	3	96	3	200	13	85	4	..	..	916	9	1,780	34	152·9	2·9
1853-54 ..	3rd Co. 1st Battalion Artillery .... 2nd Regiment European L. I. .... Garrison Details.....	763	168	2	2	..	64	..	67	1	154	6	58	3	..	..	537	4	1,050	16	137·6	2·1
1854-55 ..	3rd Co. 1st Battalion Artillery .... Garrison Details	125	55	..	3	1	9	..	11	..	20	1	2	..	..	..	80	..	180	2	144·0	1·6
1855-56 ..	3rd Co. 1st Battalion Artillery .... Garrison Details.....	124	17	..	..	..	2	..	13	1	24	1	2	..	..	..	61	..	119	2	95·9	1·6
1856-57 ..	3rd Co. 1st Battalion Artillery .... Garrison Details.....	126	19	..	..	..	9	1	5	..	15	1	7	..	..	..	88	..	143	2	113·4	1·5
1857-58 ..	3rd Co. 1st Battalion Artillery .... 2nd Regiment European L. I. .... Garrison Details.....	353	471	2	4	..	19	..	11	1	76	2	24	1	..	..	274	1	879	7	249·0	1·9
1858-59 ..	2nd Co. 1st Battalion Artillery .... 2nd Regiment European L. I. .... 3rd Co. 1st Battalion Artillery .... Garrison Details.....	662	217	..	..	..	33	1	20	4	111	5	24	..	..	..	623	..	1,028	10	155·2	1·5
1859-60 ..	2nd Co. 1st Battalion Artillery .... 1st European Regt. Fusiliers ..... 2nd Regiment European L. I. .... Garrison Details	1,541	141	1	..	..	42	2	42	1	180	2	39	..	13	7	713	3	1,170	16	75·9	1·0
	Total....	12,866	3,208	18	22	5	1,104	19	835	24	2,490	91	556	20	31	22	10,323	36	18,569	235	146·6	1·8

No. 6.—SATTARA.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Diseases of the Liver.		Diseases of the Stomach and Bowels.		Diseases of the Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1857-58 ..	Detcht. H. M.'s 14th L. Drags.	132	33	..	3	1	7	..	7	..	14	1	3	..	..	..	81	..	148	2	112·1	1·5
	,, ,, 3rd Dragoons																					
	,, ,, 33rd Regiment																					
1858-59 ..	,, ,, 3rd Dragoons	346	208	1	1	..	16	..	10	..	48	2	16	2	..	..	230	..	529	5	152·8	1·4
	,, ,, 6th ditto																					
	,, ,, 18th Rl. Irish.....																					
	,, ,, 33rd Regiment																					
	,, ,, 56th ditto																					
1859-60 ..	,, ,, 6th Dragoons.....	301	319	..	..	..	14	1	5	..	84	..	24	..	18	10	270	..	734	11	243·8	3·6
	,, ,, 31st Regiment.....																					
	,, ,, 57th ditto																					
	German Legion																					
	European Troops of the Indian Army.																					
1857-58 ..	4th Troop Horse Brigade	156	38	..	1	..	4	..	6	..	22	..	5	..	..	..	85	..	161	..	103·2	..
	2nd Co. 2nd Bat. Artillery																					
	Detcht. 3rd European Regt.																					
1858-59	2nd Co. 2nd Bat. Artillery	89	90	..	1	..	6	..	2	..	24	..	4	..	..	..	87	..	214	..	240·4	..
1859-60	Ditto ditto	82	156	..	..	..	1	..	1	..	17	1	4	..	1	1	34	..	214	2	260·9	2·4
	Total....	1,106	844	1	6	1	48	1	31	..	209	4	56	2	19	11	787	..	2,000	20	180·8	1·8

No. 7.—DEESA.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Liver.		Stomach and Bowels.		Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1850-51 ..	H. M.'s 8th Hussars.....	998	522	4	..	..	81	2	84	1	258	8	10	1	9	2	706	5	1,670	23	167·3	2·3
	,, 86th Regiment																					
1851-52	,, 8th Hussars.....	1,001	498	4	..	..	82	3	144	2	232	3	25	1	..	..	721	4	1,702	17	170·0	1·6
1852-53	,, ditto	984	487	7	1	..	93	1	103	2	160	6	29	2	..	..	632	3	1,505	21	152·9	2·1
1853-54	,, 33rd Regiment.....	33	16	..	6	..	9	1	1	..	6	..	3	..	..	..	28	..	69	1	209·0	3·0
1854-55	,, ditto	340	185	..	1	..	116	1	36	..	84	..	23	2	..	..	355	..	800	3	235·2	0·8
1855-56	,, ditto	475	291	1	3	..	42	..	18	..	31	2	28	2	..	..	282	2	695	7	146·3	1·4
1856-57	,, ditto	822	460	..	..	..	50	3	40	1	63	3	24	4	2	2	624	3	1,263	16	153·6	1·9
1857-58 ..	11th Co. Royal Engineers	686	252	1	1	1	48	2	13	..	116	1	13	2	1	..	438	1	882	8	128·5	1·1
	H. M.'s 83rd Regiment																					
	,, 89th ditto																					
	,, 95th ditto																					
1858-59 ..	,, 33rd ditto	619	474	3	3	..	70	1	19	1	90	2	21	5	..	..	461	..	1,138	12	183·8	1·9
	,, 89th ditto																					
1859-60 ..	Depôt H. M.'s 83rd ditto	878	945	14	1	..	70	..	95	4	252	4	38	5	5	4	684	..	2,090	31	238·0	3·5
	H. M.'s 33rd ditto																					
	European Troops of the Indian Army.																					
1850-51 ..	1st Troop Horse Brigade.....	108	45	1	..	..	12	..	4	..	25	1	13	..	3	3	129	..	231	5	213·8	4·6
	4th ditto																					
1851-52	ditto	109	57	2	..	..	5	..	6	..	22	1	13	..	..	..	151	..	254	3	233·0	2·7
1852-53	ditto	109	179	1	..	..	7	1	3	..	28	2	8	..	..	..	116	1	341	5	312·8	4.5
1853-54	ditto	101	64	..	2	1	6	..	8	..	21	..	7	1	..	..	129	..	237	2	234·6	2·0
1854-55 ..	2nd ditto	107	80	..	1	..	14	..	11	..	71	4	10	..	..	..	142	..	329	4	307·4	3·7
	4th ditto																					
1855-56	2nd ditto	99	43	..	..	..	9	..	5	..	47	..	9	..	..	..	149	..	262	..	264·6	..
1856-57	ditto	91	54	..	..	..	2	..	5	1	17	1	5	..	1	..	91	..	173	2	190·1	2·1
1857-58 ..	ditto	17	18	..	..	..	..	..	3	..	6	..	1	..	..	..	25	..	55	..	311·7	..
	1st Co. 2nd Battalion Artillery																					
1859-60	1st Troop Horse Brigade	121	103	..	..	..	25	..	17	..	60	..	13	1	..	..	351	..	569	1	470·2	0·8
	Total....	7,698	4,773	38	19	2	741	15	615	12	1,589	38	291	26	21	11	6,214	19	14,263	161	185·2	2·1

No. 8.—AHMEDABAD.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the								Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
							Lungs.		Liver.		Stomach and Bowels.		Brain.									
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1857-58.	Detacht. H. M.'s 72nd Hldrs.	717	445	3	..	..	92	2	3	..	70	2	5	..	..	..	236	..	851	7	118·6	0·9
	,, ,, 83rd Regt. ..																					
	,, ,, 86th ditto ..																					
	,, ,, 89th ditto ..																					
1858-59.	H. M.'s 4th K. O. Regiment.	542	834	6	..	..	46	..	23	2	223	1	18	4	..	..	433	..	1,577	13	290·9	2·3
	Detacht. H. M.'s 51st ditto..																					
	,, ,, 89th ditto ..																					
1859-60...	H. M.'s 4th K. O. Regiment.	525	670	7	..	..	29	2	42	2	114	1	10	4	3	2	336	1	1,204	19	229·3	3·6
	European Troops of the Indian Army.																					
1857-58...	1st Co. 1st Bat. Artillery	50	85	2	..	..	6	..	1	..	19	..	2	..	..	..	33	..	146	2	292·0	4·0
1858-59...	Ditto ditto	78	72	..	..	..	11	..	2	..	36	..	2	..	..	..	86	..	209	..	267·9	..
1859-60...	Ditto ditto	100	98	1	..	..	5	..	7	..	21	..	4	1	..	..	77	..	212	2	212·0	2·0
	Total....	2,012	2,204	19	..	..	189	4	78	4	483	4	41	9	3	2	1,201	1	4,199	43	208·6	2·1

No. 9.—SHOLAPOOR.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Diseases of the Liver.		Diseases of the Stomach and Bowels.		Diseases of the Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1857-58	Detcht. H. M.'s 56th Regiment	61	10	..	..	..	5	..	..	..	4	..	1	..	..	..	5	..	25	..	40·9	..
1858-59 ..	,, ,, 3rd Dragoons .... / ,, ,, 17th Lancers..... / ,, ,, 18th Royal Irish .. / ,, ,, 33rd Regt. ..... / ,, ,, 56th ditto	201	153	2	..	..	9	..	12	..	33	1	3	..	..	..	149	1	359	4	178·6	1·9
1859-60 ..	,, ,, 3rd Dragoons .... / ,, ,, 18th Royal Irish... / ,, ,, German Legion ..	314	978	3	2	..	37	..	25	2	115	7	9	1	20	9	235	..	1,421	22	452·5	7·0
	European Troops of the Indian Army.																					
1850-51	1st Co. 1st Bat. Artillery.....	105	23	..	..	..	3	..	1	..	4	..	..	..	..	..	24	..	55	..	52·3	..
1851-52	Ditto ditto	105	127	1	..	..	3	..	1	..	13	..	4	..	..	..	75	..	223	1	212·3	0·9
1852-53	Ditto ditto	111	171	1	..	..	11	..	3	..	14	1	3	..	..	..	67	..	269	2	242·3	0·8
1853-54	Ditto ditto	105	114	1	2	..	10	..	6	..	32	..	1	..	..	..	86	..	251	1	239·0	0·9
1854-55	1st Co. 2nd ditto	33	31	..	..	..	2	..	2	..	19	1	..	..	..	..	32	1	86	2	260·6	6·0
1855-56	Ditto ditto	95	104	..	..	..	5	..	18	..	25	..	1	..	..	..	105	..	258	..	271·5	..
1856-57	Ditto ditto	58	30	..	..	..	1	..	6	..	6	..	..	..	..	..	55	..	98	..	168·9	..
1857-58 ..	Detcht. 4th Troop H. Brigade..... / 2nd Co. 2nd Bat. Artillery ..... / 3rd Co. 2nd ditto	67	26	..	..	..	2	..	2	..	11	..	3	..	..	..	54	..	98	..	146·2	..
1858-59	Ditto ditto	98	22	..	..	..	7	..	2	..	20	..	6	..	..	..	65	..	122	..	124·4	..
1859-60	Ditto ditto	84	174	..	..	..	6	..	2	..	17	1	1	..	1	1	42	..	243	2	289·2	2·3
	Total....	1,437	1,963	8	4	..	101	..	80	2	313	11	32	1	21	10	994	2	3,508	34	244·1	2·3

No. 10.—AHMEDNUGGUR.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the								Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
							Lungs.		Liver.		Stomach and Bowels.		Brain.									
			Treated.	Died.	Treated	Died.	Treated.	Died.	Treated.	Died	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1857-58	Detacht. H. M.'s 33rd Regiment ..	19	..	..	1	..	..	..	..	..	....	..	2	..	..	..	19	..	22	..	121·0	..
1858-59 ..	,, ,, 3rd Dragoons ..	334	175	..	1	1	46	..	12	..	80	1	18	..	..	..	393	1	725	3	217·0	0·8
	,, ,, 18th Royal Irish..																					
	,, ,, 33rd Regiment ..																					
	,, ,, 57th ditto																					
1859-60 ..	,, ,, 3rd Dragoons ..	709	1,550	7	4	1	96	2	18	1	294	15	9	1	..	..	383	3	2,354	30	332·0	4·2
	,, ,, 28th Regiment ..																					
	,, ,, 56th ditto																					
	,, ,, 57th ditto																					
	European Troops of the Indian Army.																					
1850-51 ..	1st Battalion Artillery	381	352	..	..	..	29	..	18	..	220	4	51	..	1	1	369	1	1,040	6	272·9	1·5
1851-52 ..		505	311	..	1	..	40	1	12	1	178	1	49	..	2	1	445	1	1,038	5	205·5	0·9
1852-53 ..		463	235	..	..	..	48	1	17	..	145	4	34	..	..	..	388	..	867	5	187·2	1·0
1853-54 ..		435	115	..	..	..	46	1	18	3	90	2	20	..	2	2	382	..	673	8	154·7	1·8
1854-55 ..		311	117	..	1	..	25	..	18	1	195	10	24	..	30	19	284	..	694	30	223·1	9·6
1855-56 ..		268	156	1	2	1	22	1	21	..	76	..	18	..	..	..	221	2	516	5	192·5	1·8
1856-57 ..		196	81	..	1	..	24	..	10	..	57	..	11	..	1	..	192	..	377	..	192·3	..
1857-58 ..		155	26	..	1	..	20	..	10	..	40	..	9	..	..	..	154	..	260	..	167·7	..
1858-59 ..	1st Battalion Artillery.....	276	113	1	2	..	99	2	3	..	109	1	44	..	..	..	484	..	854	4	309·4	1·4
	Depôt 3rd European Regiment																					
1859-60 ..	1st Battalion Artillery	344	251	2	10	..	86	2	22	2	231	8	60	2	14	9	366	1	1,040	26	302·3	7·5
	Depot 3rd European Regiment																					
	Total....	4,396	3,482	11	24	3	581	10	179	8	1,715	46	349	3	50	32	4,080	9	10,460	122	237·9	2·7

No. 12.—MHOW.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers		Diseases of the								Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
							Lungs.		Liver.		Stomach and Bowels.		Brain.									
			Treated	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1857-58 ..	Detacht. H. M.'s 14th L. Dragoons.	148	59	..	..	..	16	..	14	1	42	..	2	..	21	8	94	1	248	10	167·5	6·7
	,, ,, 86th Regiment....																					
1858-59 ..	7 | 11 Royal Artillery	900	826	2	2	..	76	2	46	5	281	10	16	2	1	..	808	1	2,056	22	228·4	2·4
	Detachment H. M.'s 17th Lancers.																					
	H. M.'s 71st Highlanders																					
	,, 72nd ditto																					
	,, 92nd ditto																					
	H. M.'s Depôt.....																					
1859-60 ..	D. Troop Royal Artillery.....	1,364	1,456	14	2	..	137	2	76	6	330	5	31	6	13	8	1,069	5	3,114	46	229·0	3·3
	H. M.'s 3rd Dragoon Guards.....																					
	,, 72nd Highlanders																					
	European Troops of the Indian Army.																					
1857-58 ..	1st Troops Horse Brigade	38	9	..	..	..	3	..	1	..	16	..	1	..	..	..	38	..	68	..	178·9	..
	4th Co. 2nd Battalion Artillery....																					
	Detachment 3rd European Regt. ..																					
1859-60 ..	4th Co. 2nd Battalion Artillery	500	750	2	..	..	20	..	21	..	186	1	18	1	1	..	403	2	1,399	6	279·8	1·2
	Detachment 3rd European Regt. ..																					
	Staff and Details																					
	Total	2,950	3,100	18	4	..	252	4	158	12	855	16	68	9	36	16	2,412	9	6,885	84	233·3	2·8

No. 11.—KURRACHEE.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Diseases of the Liver.		Diseases of the Stomach and Bowels.		Diseases of the Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated	Died.	Treated.	Died	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1850-51 ..	H. M.'s 8th Regiment	1,721	491	5	..	..	139	8	141	3	446	11	47	4	..	..	1,081	4	2.345	35	136·0	2·0
	,, 64th ditto																					
	,, 83rd ditto																					
1851-52 ..	,, 64th ditto	1,629	610	11	..	..	169	7	67	1	666	49	78	7	19	12	942	5	2,551	92	156·5	5·6
	,, 83rd ditto																					
1852-53 ..	,, 64th ditto	1,681	2,798	37	1	..	193	10	69	4	418	10	110	12	1	..	866	8	4,456	81	265·0	4·8
	,, 83rd ditto																					
	,, 64th ditto																					
1853-54 ..	,, 83rd ditto	1,313	2,053	4	2	..	174	4	97	2	306	4	70	2	16	8	1,004	3	3,722	27	283·4	2·0
	,, 86th ditto																					
1854-55 ..	R. W. 83rd ditto	1,187	519	1	..	..	132	4	82	5	360	10	32	1	..	..	840	2	1,965	23	165·5	1·9
	,, 86th ditto																					
1855-56	,, 86th ditto	297	97	3	..	..	43	1	52	2	148	2	8	..	..	..	248	..	596	8	200·6	2·7
1857-58 ..	,, 4th (K O.) do.	661	196	2	..	..	5	..	5	1	40	2	..	..	..	..	144	..	384	5	58·8	0·7
	,, 51st ditto																					
1858-59 ..	,, 46th ditto	656	238	9	..	..	23	1	24	1	93	1	3	..	1	1	358	..	740	13	112·8	1·9
	,, 51st ditto																					
1859-60	,, 64th ditto	958	294	1	1	..	76	3	33	1	247	3	62	1	..	..	752	2	1,465	11	152·9	1·1
	European Troops of the Indian Army.																					
1850-51	1st Troop Horse Brigade.....	42	23	..	..	..	6	..	9	..	26	2	7	..	..	..	71	..	142	2	338·0	4·7
1851-52	ditto	120	32	..	..	..	13	..	16	1	66	2	7	..	..	..	148	..	282	3	235·0	2·5
1852-53	ditto	144	95	3	..	..	13	..	12	..	42	..	10	..	..	..	127	..	299	3	207·6	2·0

1853-54 ..	ditto ..... 2nd Regiment European L. I.	405	82	..	..	..	72	2	33	..	85	2	22	1	6	3	305	4	605	12	149·3	2·9
1854-55 ..	1st Troop Horse Brigade..... 4th ditto ..... 4th Co. 1st Battalion Artillery .... 2nd Regiment European L. I.	698	196	3	..	..	77	3	46	..	192	7	51	1	..	..	461	3	1,023	17	146·5	2·4
1855-56 ..	4th Troop Horse Brigade ..... 4th Co. 1st Battalion Artillery .... 1st European Regiment Fusiliers ..	1,067	199	3	1	..	82	2	70	4	291	6	78	..	..	..	876	2	1,597	17	149·6	1·5
1856-57 ..	4th Troop Horse Brigade ..... 4th Co. 1st Battalion Artillery .... 1st European Regiment Fusiliers .. Depôt 2nd Regiment European L. I.	1,124	466	1	..	..	103	4	73	7	222	2	92	2	..	..	926	3	1,882	19	167·4	1·6
1857-58 ..	3rd Troop Horse Brigade ..... 1st Co. 2nd Battalion Artillery .... 4th Co. Reserve Artillery ..... 1st European Regiment Fusiliers .. 2nd Regiment European L. I.	802	1,277	6	..	..	70	4	75	8	244	6	33	2	..	..	602	7	2,307	33	287·6	4·1
1858-59 ..	4th Co. Reserve Artillery..... 1st European Regiment Fusiliers ..	191	207	..	..	..	22	..	27	..	95	3	40	..	..	..	315	3	706	6	369·6	3·1
1859-60 ..	2nd Troop Horse Brigade ..... 1st Co. 3rd Battalion Artillery .... 4th Co. 3rd ditto .... 1st European Regiment Fusiliers .. 3rd European Regiment	969	494	1	..	..	81	3	65	4	279	6	68	2	10	2	1,006	9	2,003	27	206·7	2·7
	Total....	15,665	10,367	90	5	..	1,493	56	996	44	4,266	128	818	35	53	26	11,072	55	29,070	434	185·5	2·7

No. 13.—HYDRABAD.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the								Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
							Lungs.		Liver.		Stomach and Bowels.		Brain.									
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1850-51 ..	L. W. H. M.'s 8th Regiment	523	303	1	..	..	13	..	51	..	90	..	13	..	..	..	367	..	837	1	160·0	0·1
	R. W. ,, 64th ditto																					
1851-52	,, ,, 64th ditto	446	322	10	..	..	23	..	49	..	144	5	15	1	..	..	379	1	932	17	208·9	3·8
1852-53 ..	,, ,, 64th ditto	443	1,542	28	..	..	15	..	17	..	79	1	21	3	..	..	198	1	1,872	33	422·5	7·4
	,, ,, 83rd ditto																					
1853-54 ..	,, ,, 83rd ditto	370	316	..	..	..	18	3	6	..	50	1	11	2	..	..	185	..	586	6	158·3	1·6
	,, ,, 86th ditto																					
1854-55	,, ,, 86th ditto	249	143	..	..	..	17	..	29	1	135	1	9	1	..	..	226	1	559	4	224·4	1·6
1858-59 ..	Detcht. ,, 46th ditto	125	50	..	..	..	21	..	6	..	45	1	3	..	..	..	122	..	247	1	197·6	0·8
	,, ,, 51st ditto																					
1859-60	,, ,, 64th ditto	139	28	..	..	..	7	..	12	2	20	1	9	..	..	..	101	..	177	3	127·3	2·1
	European Troops of the Indian Army.																					
1851-52	1st Troop Horse Brigade.....	23	3	..	..	..	..	..	1	..	6	..	4	..	..	..	25	..	39	..	169·5	..
1854-55	2nd Regt. European L. I.	170	32	..	..	..	8	1	14	1	23	..	12	..	..	..	109	..	198	2	116·4	1·1
1855-56 ..	4th Troop Horse Brigade	905	530	5	..	..	61	3	50	2	218	4	115	5	..	..	693	3	1,667	22	184·1	2·4
	4th Co. 1st Battalion Artillery																					
	2nd Regt. European L. I.																					
1856-57	2nd ditto	520	1,267	11	..	..	51	2	14	..	127	9	68	7	..	..	419	..	1,946	29	374·2	5·5
1857-58 ..	3rd Troop Horse Brigade	52	76	..	..	..	5	1	4	1	12	2	2	..	..	..	54	..	153	4	294·2	7·6
	4th Co. 1st Battalion Artillery																					
1858-59 ..	3rd Co. 1st ditto	85	52	..	..	..	3	..	8	..	17	1	6	..	..	..	87	..	173	1	203·5	1.1
	4th Co. 1st ditto																					
1859-60 ..	3rd Co. 1st ditto	131	42	1	..	..	14	1	13	..	34	..	6	..	..	..	147	1	256	3	195·4	2·2
	Detacht. 1st E. R. (Fusiliers)																					
	Total.....	4,181	4,706	56	..	..	256	11	274	7	1,000	26	294	19	..	..	3,112	7	9,642	126	230·6	3·0

No. 14.—NEEMUCH.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Diseases of the Liver.		Diseases of the Stomach and Bowels.		Diseases of the Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated	Died.
	Queen's Troops.																					
1857-58 ..	Detacht. H. M.'s 83rd Regt.	100	146	1	..	..	6	..	2	..	17	..	3	..	..	..	43	..	217	1	217·0	1·0
1858-59.	„ „ 72nd Hhlders.	751	835	11	..	..	99	3	26	1	154	8	17	4	..	..	421	2	1,552	29	206·6	3·8
	„ „ 89th Regt. ..																					
	„ „ 95th ditto. ..																					
	11th Co. Royal Engineers..																					
1859-60.	6th | 13th Royal Artillery .	984	2,203	7	8	1	59	..	102	9	216	3	21	1	..	..	870	5	3,479	26	353·5	2·6
	Detacht. H. M.'s 8th Hussars.																					
	„ „ 89th Regt. ..																					
	H. M.'s 95th Regiment																					
	European Troops of the Indian Army.																					
1858-59	1st Co. 2nd Bat. Artillery..	66	29	1	..	..	2	..	2	1	11	..	1	..	..	..	50	..	95	2	143·9	3·0
	3rd Co. 4th ditto ..																					
1859-60 ..	1st Co. 2nd ditto ..	73	86	1	..	..	9	..	4	..	14	1	1	..	..	..	51	..	165	2	226·0	2·7
	Total....	1,974	3,299	21	8	1	175	3	136	11	412	12	43	5	..	..	1,435	7	5,508	60	279·0	3·0

No. 15.—BOMBAY.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Diseases of the Liver.		Diseases of the Stomach and Bowels.		Diseases of the Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1850-51	L. W. H. M.'s 78th Highlanders ..	519	183	4	..	..	18	1	56	4	293	8	7	..	42	15	357	..	956	32	184·2	6·1
1851-52	,, ditto ..	535	66	2	1	1	13	2	123	3	481	8	5	1	1	1	339	3	1,029	21	192·3	3·9
1852-53	,, ditto ..	393	276	1	..	..	14	..	49	6	361	7	8	..	..	..	288	1	996	15	253·4	3·8
1854-55	R. W. 83rd Regiment	45	17	..	..	..	2	..	1	..	7	1	1	..	..	..	35	..	63	1	140·0	2·2
1855-56 ..	,, ditto ..... ,, 86th ditto	561	349	..	..	..	55	3	33	..	137	2	50	6	5	4	546	2	1,175	17	209·4	3·0
1856-57	Hd. Qrs. 86th ditto	447	473	2	..	..	73	3	57	3	141	3	23	1	..	..	356	3	1,123	15	251·2	3·3
1857-58 ..	H. M.'s 8th Hussars..... ,, 33rd Regiment..... ,, 51st ditto ..... ,, 71st Highlanders..... ,, 72nd ditto ..... Wing 86th Regiment ..... ,, 92nd Highlanders ..... ,, 95th Regiment	2,119	87	1	6	..	79	..	13	1	79	1	13	2	..	..	440	1	717	6	33·8	0·2
1858-59 ..	,, 28th ditto ..... ,, 57th ditto ..... ,, 86th ditto ..... ,, 92nd Highlanders	912	1,517	1	1	1	31	..	12	1	76	3	22	..	..	..	584	..	2,243	6	245·9	0·6
1859-60 ..	,, 28th Regiment ..... ,, 86th ditto	634	376	6	1	..	37	4	15	..	124	10	8	..	..	..	511	4	1,072	24	169·0	3·7

	European Troops of the Indian Army.																					
1850-51	2nd Battalion Artillery		157	176	..	..	..	20	1	16	1	85	12	22	2	10	6	267	..	596	22	379·6	14·0
1851-52	ditto		74	32	..	..	..	7	..	13	..	52	4	1	..	..	..	81	2	186	6	251·3	8·1
1852-53 ..	ditto		221	86	1	..	..	28	1	11	..	68	1	16	1	..	..	294	2	503	6	227·6	2·7
	L. W. 1st E. R. (Fusiliers).....																					
1853-54 ..	2nd Battalion Artillery		543	222	2	1	2	38	5	71	7	183	3	30	1	2	..	593	7	1,141	26	210·1	4·7
	R. W. 1st E. R. (Fusiliers).....																					
1854-55 ..	2nd Battalion Artillery		450	239	2	..	..	30	1	46	5	192	8	80	..	1	1	523	5	1,111	22	246·8	4·8
	R. W. 1st E. R. (Fusiliers)																					
1855-56	2nd Battalion Artillery		146	136	..	..	..	28	..	23	.	70	3	11	..	..	..	206	1	474	4	324·6	2·7
1856-57	ditto		123	135	1	..	..	19	..	22	5	83	7	16	2	1	..	156	..	432	15	351.2	12·2
1857-58	ditto		31	29	..	..	..	9	..	6	..	15	..	4	..	1	..	59	1	123	1	396.7	3·2
1858-59 ..	ditto		40	21	..	..	..	12	1	6	..	13	..	11	1	..	..	51	..	114	2	285·0	5·0
	4th Co. 1st Battalion Artillery																					
1859-60 ..	2nd Battalion Artillery		233	86	1	..	..	35	3	9	1	102	7	20	1	13	8	209	..	474	21	203·4	9·0
	4th Co. 1st ditto																					
	2nd Regiment European L. I.																					
	Total....		8,183	4,506	24	11	3	548	25	582	37	2,562	88	348	18	76	35	5,895	32	14'528	262	177·5	3·2

No. 16.—NUSSEERABAD.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Liver.		Stomach and Bowels.		Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1857-58 ..	3 | 14 Royal Artillery	453	435	4	13	2	32	2	17	1	68	2	14	2	3	2	263	..	845	15	186·5	3·3
	H. M.'s 83rd Regiment																					
	,, 95th ditto																					
1858-59 ..	,, 8th Hussars	1,301	1,198	23	9	..	81	3	83	4	361	20	71	22	..	..	1,397	6	3,200	78	245·9	5·9
	,, 83rd Regiment																					
1859-60 ..	,, 8th Hussars	1,658	1,179	12	4	..	114	4	67	7	333	12	49	4	4	..	1,553	2	3,303	41	199·2	2·4
	,, 83rd Regiment																					
	European Troops of the Indian Army.																					
1850-51	3rd Co. 2nd Bat. Artillery	104	58	3	..	..	6	..	2	..	56	4	10	..	3	..	142	1	277	8	266·3	7·6
1851-52	Ditto ditto	102	69	..	..	..	7	1	6	..	28	..	6	..	2	..	141	..	259	1	253·9	0·9
1852-53	Ditto ditto	110	90	..	1	..	4	..	7	1	35	1	15	..	..	..	134	..	286	2	260·0	1·8
1853-54 ..	2nd Co. 2nd ditto	116	50	1	1	..	2	..	5	..	22	..	8	..	..	..	122	..	210	1	181·0	0·8
	3rd Co. 2nd ditto																					
1854-55	4th Co. 2nd ditto	115	90	3	..	..	1	..	1	..	39	2	6	2	..	..	85	1	222	8	193·0	6·9
1855-56	Ditto ditto	105	49	2	..	..	..	..	3	..	12	..	8	..	..	..	42	..	114	2	108·5	1·9
1856-57	Ditto ditto	99	18	..	1	..	1	..	6	..	16	1	5	..	..	..	86	..	133	1	134·3	1·0
1857-58	2nd Troop Horse Brigade	69	115	..	1	..	6	..	2	1	11	1	2	..	..	..	68	..	205	2	297·1	2·9
1858-59	2nd ditto	141	133	2	1	..	5	..	14	1	48	3	10	..	1	..	145	1	357	7	253·1	4·9
1859-60	3rd ditto	122	54	1	1	..	10	..	11	..	25	1	..	..	2	1	182	..	285	3	233·6	2·4
	Total....	4,495	3,538	51	32	2	269	10	224	15	1,054	47	204	30	15	3	4,360	11	9,696	169	215·7	3·7

No. 17.—BARODA.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers		Diseases of the Lungs.		Diseases of the Liver.		Diseases of the Stomach and Bowels.		Diseases of the Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1857-58	X. Battery Royal Artillery.	251	30	..	..	..	14	1	1	..	14	..	5	..	..	..	49	1	113	2	45·0	0·8
	Detach. H. M.'s 4th K. O. Regt.																					
	,, ,, 72nd Hhldrs.....																					
	,, ,, 86th Regt.																					
1858-59	X. Battery Royal Artillery	283	561	6	..	..	43	1	9	1	92	..	35	6	..	..	248	..	988	14	349·1	4·9
	K. ditto ditto																					
	Detach. H. M.'s 33rd Regt.																					
	,, ,, 51st ditto																					
1859-60	1 | 13 Royal Artillery	528	1,142	4	..	..	49	2	25	1	104	1	21	15	7	5	320	1	1,668	29	315·9	5·4
	Detach. H. M.'s 4th K. O. Regt.....																					
	,, ,, 33rd Regt.																					
	Total	1,062	1,733	10	..	..	106	4	35	2	210	1	61	21	7	5	617	2	2,769	45	260·7	4·2

No. 18.—SURAT.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Diseases of the Liver.		Diseases of the Stomach and Bowels.		Diseases of the Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
	Queen's Troops.																					
1857-58...	Detacht. H. M.'s 86th Regt.	55	63	..	..	..	6	..	2	..	25	..	5	..	2	..	29	..	132	..	240·0	..
1858-59.	2 | 11 Royal Artillery	55	112	1	1	..	8	..	8	..	37	4	4	1	..	..	37	..	208	6	378·1	10·9
	Detacht. H. M.'s 83rd Regt.																					
	„ „ 92nd Hhldrs.																					
1859-60...	Detach. H. M.'s 4th K.O. Regt.	66	271	1	1	..	1	..	7	..	26	2	7	..	..	..	52	..	364	3	551·5	4·5
	Total....	176	446	2	2	..	15	..	17	..	88	6	16	1	2	..	118	..	704	9	400·0	5·1

No. 19.—POORUNDUR SANATARIUM.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Diseases of the Liver.		Diseases of the Stomach and Bowels.		Diseases of the Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
1852-53 ..	Sanatarium	43	91	..	..	..	1	..	6	1	26	..	4	..	..	..	54	1	182	2	423·2	4·6
1853-54 ..		78	152	1	..	..	6	..	5	2	35	1	3	..	..	..	37	..	238	4	305·1	5·1
1854-55 ..		85	137	..	..	..	9	..	7	..	42	2	3	..	1	1	64	..	263	3	309·4	3·5
1855-56 ..		68	115	..	..	..	4	..	6	..	28	..	9	..	..	..	60	..	222	..	326·4	..
1856-57 ..		51	72	..	..	..	4	1	5	1	35	..	6	..	..	..	99	..	221	2	433·3	3·9
1857-58 ..		62	56	..	..	..	11	..	20	1	35	2	5	..	..	..	85	1	212	4	307·2	5·7
1858-59 ..		84	100	..	1	..	29	.	25	4	100	..	8	1	..	..	156	1	419	6	498·8	7·1
1859-60 ..		83	162	..	..	..	21	2	25	1	58	..	12	..	2	2	152	1	432	6	520·4	7·2
	Total....	561	885	1	1	..	85	3	99	10	359	5	50	1	3	3	707	4	2,189	27	390·1	4·8

No. 20.—ABOO SANATARIUM.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Diseases of the Liver.		Diseases of the Stomach and Bowels.		Diseases of the Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
1850-51 ..	Sanatarium	5	6	..	..	..	1	..	2	..	7	..	..	..	..	..	15	..	31	..	7.7	..
1851-52 ..		47	21	..	..	..	4	1	22	4	27	2	4	..	..	..	50	1	128	8	268·6	16·7
1852-53 ..		48	10	..	..	..	8	..	16	1	16	..	2	..	..	..	42	1	94	2	194·4	4·1
1853-54 ..		90	70	1	..	..	10	..	7	..	40	3	10	1	..	..	47	2	184	7	204·4	7·7
1854-55 ..		30	137	..	..	..	2	..	3	..	8	..	3	..	..	..	38	..	191	..	636·6	..
1855-56 ..		74	142	..	..	..	10	..	3	..	36	..	10	..	..	..	58	..	259	..	350·0	..
1856-57 ..		87	115	..	1	..	5	..	8	..	39	1	8	..	..	..	70	..	245	1	281·6	1·1
1857-58 ..		91	98	..	3	1	9	1	8	..	16	..	5	..	..	..	110	1	249	3	273·6	3·2
1858-59 ..		135	257	..	3	..	14	1	9	..	31	..	6	..	..	..	77	..	397	1	294·0	0·7
1859-60 ..		160	153	1	..	..	7	..	18	1	36	2	3	1	..	..	69	2	286	7	178·8	4·3
	Total.....	767	1,009	2	6	1	70	3	96	6	256	8	51	2	..	..	576	7	2,064	29	269·1	3·7

No. 21.—GHIZREE SANATARIUM.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the Lungs.		Liver.		Stomach and Bowels.		Brain.		Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
1855-56..	Sanatarium.	73	59	..	..	..	31	1	43	1	76	1	18	1	..	..	144	1	371	5	508·2	6·8
1856-57..		59	200	1	..	..	20	2	22	..	48	1	13	..	..	..	136	1	439	5	744·0	8·4
1857-58..		46	116	..	..	..	8	1	18	1	30	..	3	..	..	..	134	1	309	3	671·7	6·5
1858-59..		36	48	..	..	..	6	..	5	..	17	..	5	..	..	..	102	1	183	1	508·3	2·7
1859-60..		42	58	..	..	..	8	1	14	..	31	..	9	..	..	..	119	..	239	1	569·0	2·3
	Total.....	256	481	1	..	..	73	5	102	2	202	8	48	1	..	..	635	4	1,541	15	601·9	5·8

REPORT ON THE HEALTH OF EUROPEAN AND NATIVE TROOPS IN THE BOMBAY PRESIDENCY FOR 1860.

Presented by the Principal Inspector General, Medical Department.

The accompanying returns show the sickness and mortality in Her Majesty's Home and Indian Troops (European and Native) in the Bombay Presidency, during the year ending 31st December 1860. The columns regarding men "Invalided" are left blank.

The year 1860 was on the whole an average healthy year for European Troops in this Presidency, and the sickness and mortality did not vary much from the preceeding year. The strength of the Home Regiments was diminished about 5,000 men during the year, thus in 1859 it was upwards of 17,000 (viz. 17,328), whilst in 1860, it was little over 12,000 (viz. 12,071). The strength of the local European Regiments differed but slightly from that of 1859, being in the former year 4,417, and in the latter 4,321. The number of Native Troops was reduced from upwards of 40,000 in 1859, to about 37,500 in 1860. The health of the Native Army continued much the same as in previous years, and calls for no special remark. The causes of mortality amongst the European Troops of both Services are classified in the Tables under "deaths from ordinary causes," and "deaths from cholera," but the admissions into Hospitals are not separately shown as "general" and "special" and refer to both causes combined. The admissions into Hospitals during 1860 were, when compared with 1859, proportionately fewer; thus amongst the Home Troops they were in 1859 nearly 37,000 out of a strength of about 17,000 being about 212 per cent., whilst

in 1860, they were only about 23,817 out of a strength of 12,000 *i. e.* about 197 per cent., and in the Local Regiments the average proportion was reduced from nearly 212 per cent. to about 202 per cent.

Mortality.—The total number of deaths in the Line Regiments was 360, in proportion to strength about 2·9, which is the same as last year. Deaths from cholera numbered 102, being a per centage of 0·8 to strength, whilst in 1859 it was only 0·4. The total number of deaths in the Local Force was 113, being in proportion to strength 2·6, whereas in 1859 the percentage was 3·4. There were only 17 deaths from cholera in this Force in 1860, opposed to 33 in the former year. In contrasting the two Services it may be said, that on the whole there was a proportionate larger amount of sickness amongst the Local than amongst the Line Troops, that is as 202 per cent. admissions into Hospitals, represents the former, and 197 per cent. the latter, but that the mortality was greater amongst the Line than amongst the Local Troops as 2·9 per cent is greater than 2·6 per cent. The reason of the increased mortality in the Line Troops is to be traced to epidemic cholera, attacking the Troops stationed in Gujarat, thus from it H. M.'s 33rd Regiment lost 42 men at Deesa, Baroda, and Ahmedabad, and in the 4th K. O., 13 fatal cases of cholera occurred, also stationed at Ahmedabad, Surat, &c. the only Europeans belonging to the Local Force in Gujarat were the Battery of Artillery at Ahmedabad, but no case of cholera happened amongst it. The diseases which were most fatal in the Line Regiments stood in the following order:—Cholera 102, Fever 64, Dysentery 43, Hepatitis 36, Diseases of the Brain 31, Phthisis 21. In the local Regiments, Dysentery 24, Hepatitis 18, Cholera 17, Diseases of the Brain 9, Fever 8, Phthisis 5. The most striking circumstances is the number of deaths from Phthisis in both services, viz. 21 in the Line, and 5 in the Local Troops. The Stations of the Line Regiments in which the heaviest mortality occurred were, as before observed, in Gujarat, then in Rajpootana, in Bombay, Poona, and Belgaum, as will be seen by reference to Table B. In Table C the Stations of the Local service are shown, and opposite to Bombay, Kurrachee, and Ahmednuggur, are the largest number of deaths

recorded. It will be observed, that at the several sanitaria stations but few deaths happened, and those chiefly from diseases which had baffled remedial means at other places, or were of such uncertain nature as to be classed under "other Diseases."

A.

RETURN showing the Sickness, Mortality, and Invaliding in Her Majesty's European and Native Troops in the Bombay Presidency for the year ending 31st December 1860.

YEARS.	Presidency.	Military Europeans and Natives.		Average Strength.		Admission into Hospital during the year.		Deaths from Ordinary causes.		Deaths from Cholera.		Invalided.	Ratio per cent. of Ordinary deaths to Strength		Ratio per cent. of deaths by Cholera to Strength		Ratio per cent. of deaths generally to Strength		Ratio per cent. of number Invalided.	Remarks.
				1860	1859	1860	1859	1860	1859	1860	1859		1860	1859	1860	1859	1860	1859		
1860	Bombay ..	H. M.'s British Troops ..		12,071	17,328	23,817	36,888	258	438	102	79		2·1	2·5	0·8	0·4	2·9	2·9		
		H. M.'s Indian Troops	Europeans	4,321	4,417	8,765	9,357	96	121	17	33		2·2	2·7	0·4	0·7	2·6	3·4		
			Natives ..	37,642	40,818	44,371	51,931	283	373	88	111		0·7	0·9	0·2	0·3	0·9	1·2		

B.

TABLE showing the Mortality among Her Majesty's British Troops with Classes of Diseases during the year 1860.

CORPS.	STATIONS.	Strength.	I. Fevers.	II. Eruptive Fevers.	III. Diseases of the Lungs.	IV. Diseases of the Liver.	V. Diseases of the Stomach and Bowels.	VI. Epidemic Cholera.	VII. Diseases of the Brain.	VIII. Dropsies.	IX. Rheumatic affection.	X. Venereal affections & Diseases of the Genital Organs.	XII. Wounds and Injuries.	XVI. Other Diseases.	Total.
H. M.'s 33rd Regiment	Deesa, Dwarka, Baroda, Aboo and Ahmedabad..	963	5	..	1	3	7	42	3	..	..	1	..	..	62
,, 4th K. O. do.	Ahmedabad, Surat, Baroda and Aden	900	11	..	1	4	4	13	13	..	..	....	1	..	47
,, 95th do.	Neemuch, Sehore, and Poona ..	855	8	1	..	5	6	16	1	..	..	....	..	..	37
,, 56th do.	Belgaum, Poona, Ahmednuggur, Kolapoor, Sattara, and Bombay.	966	10	..	2	..	2	14	6	..	..	....	..	1	35
,, 28th do.	Poona, Ahmednuggur, Nusseerabad and Mhow..	901	14	2	..	1	7	..	..	..	..	....	..	..	24
,, 8th Hussars	Nusseerabad, and Neemuch ..	638	5	..	5	2	4	1	1	..	1	....	1	..	20
,, 57th Regiment	Aden, Poona, and Sattara.. ..	778	2	..	4	..	3	4	..	1	..	....	1	..	15
,, 72nd Highlanders ..	Mhow, Augur, and Sehore ..	817	1	..	1	5	4	..	2	..	..	....	..	1	14
,, 83rd Regiment	Nusseerabad, Belgaum, and Kolapoor	955	..	..	1	2	1	5	1	1	..	....	..	1	12
,, 3rd Drag. Guards ..	Mhow, Kirkee, Poona, and Ahmednuggur	604	2	..	1	1	5	..	..	..	..	....	1	..	10
,, 64th Regiment	Kurrachee and Hydrabad ..	969	2	..	3	3	1	1	..	..	..	....	..	..	9
1 | 13 Royal Artillery	Baroda and Poona..	192	1	..	..	..	3	..	1	..	..	....	..	..	5
H. M.'s 6th Drag. Guards ..	Kirkee, Sattara, and Ahmednuggur..	689	1	..	..	1	....	..	..	..	..	....	1	..	3
D. Troop Royal Artillery ..	Mhow	216	..	..	..	1	....	..	..	..	..	....	..	1	2
6 | 13 Royal Artillery	Neemuch	132	1	..	..	1	....	..	..	..	..	....	..	..	2
7 | 13 ditto	Poona	198	..	..	..	..	1	..	1	..	..	....	..	..	2
5 | 13 ditto	Aden	118	..	..	..	..	....	..	..	..	..	....	..	1	1
Hd. Qrs. ditto	Poona	45	..	..	..	2	1	..	..	..	..	....	..	..	3
Details H. M.'s Regiments ..	Poona	126	..	..	..	1	2	1	..	..	..	....	..	..	4
H. M.'s Depôt	Kurrachee	361	..	..	5	..	4	3	1	1	..	....	..	1	15
Sanatarium	Colaba	275	..	..	5	4	7	2	1	..	..	1	..	1	21
Ditto	Poorundhur..	91	..	..	..	..	....	..	..	..	..	1	..	2	3
Ditto	Aboo	85	..	..	3	1	....	..	..	..	..	1	..	2	7
Ditto	Gizree	20	..	..	..	1	....	..	..	..	..	....	..	1	2
Ditto	Tarraghur	16	..	..	..	..	....	..	..	..	..	....	..	..	..
General Depôt	Poona and Khandalla	161	1	..	..	..	3	..	..	1	..	....	..	..	5
	Total ..	12,071	64	3	32	37	65	102	31	4	1	4	5	12	360

C.

TABLE showing the Mortality among Her Majesty's Indian European Troops with Classes of Diseases for the year 1860.

CORPS.	STATIONS.	Strength.	I. Fevers.	II. Eruptive Fevers.	III. Diseases of the Lungs.	IV. Diseases of the Liver	V. Diseases of the Stomach and Bowels.	VI. Epidemic Cholera.	VII. Diseases of the Brain.	VIII. Dropsies.	IX. Rheumatic Affections.	X. Venereal affections and Diseases of the Genital Organs.	XII. Wounds and Injuries.	XVI. Other Diseases.	Total.
2nd Eur. Regiment L. I.	Bombay and Kolapoor	627	2	..	2	2	13	11	1	..	..	....	1	..	32
3rd European Regiment	Kurrachee and Hydrabad	895	2	..	1	3	6	2	1	..	..	....	..	2	17
1st & 3rd Battalion Artillery	Ahmednuggur and Kirkee	461	2	1	1	3	6	..	3	..	..	....	..	..	16
4th Troop H. B. & Hd. Qrs.	Poona	177	..	..	4	..	2	..	..	..	1	....	..	2	9
2nd ditto	Kurrachee	139	..	..	1	1	....	2	2	..	..	....	..	..	6
1st Eur. Regt. (Fusiliers)	Belgaum, Dharwar, Kolapoor, and Poona	561	1	..	2	1	1	..	..	..	..	....	..	1	6
4th Co. 1st Bat. Artillery	Bombay	80	..	..	..	1	2	..	..	..	..	...	..	..	3
1st Troop Horse Brigade	Mhow	135	..	..	1	1	....	..	..	..	..	....	..	..	2
3rd ditto	Nusseerabad	136	..	..	..	1	....	..	..	..	..	....	..	1	2
1st Co. 2nd Bat. Artillery	Neemuch, Indore, and Sehore	92	..	..	..	1	....	..	..	..	..	....	..	1	2
3rd Co. 2nd ditto	Sholapoor	81	..	..	..	..	1	..	..	1	..	....	..	..	2
4th Co. 2nd ditto	Mhow and Sehore	90	..	..	..	1	....	..	1	..	..	....	..	..	2
1st Co. 3rd ditto	Kurrachee	82	..	..	1	..	....	..	..	..	..	1	..	..	2
2nd Battalion ditto	Bombay	24	..	..	..	..	....	1	..	..	..	....	..	..	1
2nd Co. 3rd Bat. Artillery	Ahmednuggur	17	..	..	..	..	....	..	..	..	..	....	..	1	1
4th Co. 3rd ditto	Bhooj and Kurrachee	84	..	..	1	..	....	..	..	..	..	....	..	..	1
1st Co. 1st ditto	Ahmedabad and Kirkee	93	..	..	..	..	....	..	..	..	..	....	..	..	..
2nd Co. 1st ditto	Belgaum	96	..	..	..	..	....	..	..	..	..	....	..	..	..
3rd Co. 1st ditto	Hydrabad	77	..	..	..	..	....	..	..	..	..	....	..	..	..
2nd Co. 2nd ditto	Sattara	81	..	..	..	..	....	..	..	..	..	....	..	..	..
3rd Co. 3rd ditto	Kolapoor and Ahmedabad	102	..	..	..	..	....	..	..	..	..	....	..	..	..
European Depôt	Bombay	61	..	..	2	3	....	1	..	..	1	....	..	..	7
Staff Hospital	Poona	28	..	..	..	..	....	..	1	..	..	....	..	..	1
ditto	Belgaum	40	..	..	..	..	....	..	..	..	..	....	..	..	..
ditto	Mhow	28	..	..	..	..	....	..	..	..	..	....	..	..	..
ditto	Ahmednuggur	34	1	..	..	..	....	..	..	..	..	....	..	..	1
	Total..	4,321	8	1	16	18	31	17	9	1	2	1	1	8	113

TABLE of Cases of Lithotomy performed by Dr. Asher at the Civil Hos-

No.	Names.	Age.	Caste.	Sex.	Occupation.	Duration of Disease.	Date of Admission.	Date of Operation.
							1860	1861
1	Dadoo	34	Mussulman.	Male.	Labourer		26th Dec.	1st Jan.
							1861	
2	Khallunnoo, Khutiana.	35	,,	,,	,,		31st Jan.	2nd Feb.
3	Oobhaya, Chachia	38	,,	,,	,,		9th Feb.	11th Feb.
4	Sadick, Magrind.....	6	,,	,,	,,		,,	,,
5	Ahmed Memoon, Meerpore	35	,,	,,	,,		16th ,,	18th ,,
6	Ramjan Pown, Degree.	38	,,	,,	,,		17th ,,	,,
7	Soomur, Soomer	9	,,	,,	Fuckeer's son.		5th Mar.	18thMar.
8	Kumall, Nubbe	3	,,	,,	Weaver's son.		6th ,,	,,
9	Ramjan, Hydrabad ..	5	,,	,,	,,		16th ,,	,,
10	Butchul Saha, Kheyrpore	36	,,	,,	Labourer		29th ,,	1st Apr.
11	Moolla	4	Hindoo....	,,	,,		31st ,,	8th ,,
12	Saha, Gunib's Gate ..	13	Mussulman.	,,	,,		2nd Apr.	,,
13	Kaddoo, Meerpore	36	,,	,,	,,		6th ,,	,,
14	Munnoo, Halla-potia ..	8	Hindoo....	,,	Cobbler's son.		13th ,,	15th ,,
15	Suchris, Soomer	7	Mussulman.	,,	Labourer		17th ,,	22nd ,,
16	Sazee Ruchio, Bagool's-Gate	6	,,	,,	,,		18th ,,	,,
17	Alahabad, Jhoonda....	28	,,	,,	,,		25th May	30th May
18	Goolam Hyder, Gulmahomed's Gate	65	,,	,,	,,		16th June	24thJune
19	Methoo, Hydrabad	8	Hindoo....	,,	,,		24th ,,	,,
20	Achur, Dora Tanda ..	22	Mussulman.	,,	,,		1st July	2nd July
21	Ahmed, Mahomed Khan's Tanda	32	,,	,,	,,		14th ,,	15th ,,
22	Goolm, Mea Khan's Tanda	26	,,	,,	,,		17th ,,	23rd ,,
23	Butchul, Mahomed Khan's Tanda	3	,,	,,	,,		25th ,,	29th ,,
24	Zara, Matla.....	30	,,	,,	,,		31st ,,	5th Aug.
25	Hanoo, Giddoo Bunder.	9	Hindoo....	,,	Bunya's son..		2nd Aug.	,,
26	Peroze, Adamjee's Tanda	6	Mussulman.	,,	Labourer		,,	,,
27	Noor Mahomed, Shahabunder	10	,,	,,	,,		6th ,,	12th ,,
28	Khoshal, Meer Vuha..	5	Hindoo....	,,	Bunya's son..		11th ,,	3rd Sept.
29	Thawoo, Habrund Kullee	10	,,	,,	,,		13th ,,	20th Aug.
30	Khubben, ...	7	,,	,,	....		9th Sept.	10thSept.

Impossible to ascertain with any degree of accuracy.

The subjects of the disease were not afforded by any one locality, but seemed to be
The exact ages of the patients could not be ascertained ; more than the half were under
to be noted that the Hindoo was not exempted, and that the agricultural population in
Only one case of calculus in a female presented itself (an otherwise very unhealthy
The proportion of deaths is 13·3 per cent.
The average weight of calculi is 1 oz. 2 drs. 19 grs.

* As estimated from the appearance on section : for the indications of these

pital, Hydrabad (Scind), between 1st January and 10th September 1861.

Discharge or death.	Number of days under treatment after operation.	Result.	No. of Calculi.	Probable Composition of Calculi. *	Weight of Calculi.	Remarks.
1861					oz. dr. gr.	
18th Jan.	17 days	Cured ..	2	{ C c / E or F }	2 0 30	
13th Feb.	11 ,,		1	C	0 1 6	
8th Mar.	25 ,,		1	C i	1 4 10	
7th ,,	24 ,,	,,	1	B h	1 3 40	
22nd ,,	32 ,,	,,	1	A	1 4 0	
26th Feb.	2 ,,	Died....	1	C a	2 2 2	Suppression of Urine.
6th Apr.	19 ,,	Cured ..	1	B b	0 5 10	
20th Mar.	2 ,,	Died....	1	C b	0 0 30	Peritonitis.
18th Apr.	31 ,,	Cured ..	1	B b	0 1 48	Fragments.
22nd ,,	21 ,,	,,	1	C d	3 3 3	
23rd ,,	15 ,,	,,	1	B h	0 6 0	
24th ,,	16 ,,	,,	1	C c	0 0 30	Fragments.
,,	,,	,,	1	C a	6 0 30	
5th May.	19 ,,	,,	1	C	2 0 0	
15th ,,	23 ,,	,,	1	B b	0 0 50	Fragments.
23rd Apr.	1 ,,	Died....	1	C b	0 1 38	Peritonits.
12th June.	13 ,,	Cured ..	1	C a	2 1 10	Fragments.
7th July.	,,	,,	1	B e	3 3 10	
5th ,,	11 ,,	,,	1	B i	0 1 18	
19th ,,	17 ,,	,,	1	C d	2 2 2	
4th Aug.	20 ,,	,,	1	C d	2 5 0	
16th ,,	24 ,,	,,	1	A	0 3 34	
30th ,,	1 ,,	Died....	1	B h	0 1 0	
19th ,,	14 ,,	Cured ..	1	C a	3 0 15	
,,	,,	,,	1	B b	0 0 30	
,,	,,	,,	1	C h	0 4 10	
....	....	,,	2	C i	0 4 6	Fragments.
....	....	....	2	B ?	....	
1st Sept.	12 days	....	3	....	0 2 10	
....	....	....	1	....	0 0 36	Fragments.

derived from Central Scind generally.
12 years. By far the greater proportion of sufferers was of the Mussulman caste, but it is which the disease mostly prevails, is almost wholly Mussulman.
young girl), whose friends would not entertain the idea of an operation.

letters, see the volume of the Transactions for 1859, p 143 (H. V. C).

APPENDIX.

APPENDIX.

No. 1.

Notes on the Possibility of the Embryos of the Guinea-Worm and so-called "Fungus-Disease" of India, respectively, entering the Human Body through the Sudorific Ducts.—By H. J. Carter, F.R.S.

Presented October 1861.

In my "Observations on *Dracunculus*," published in the IVth No. of the "Transactions" of the Society (New Series), I have stated, at page 217, that the young Filaridæ of the free species, which abound in the Island of Bombay during the "Rains," and throughout the year in most of the Tanks, "might pass into the human body through the skin direct, or indirectly through the ducts of the sudorific glands, the latter being much larger in calibre (viz. 1-1200th of an inch), than these young Filaridæ"; assuming that *Dracunculus*, when fully developed in the human body, is a monster-growth of a worm, whose natural habitat is out of the body; that the young ones which it then brings forth are too delicate to maintain an independent existence and thus unable to propagate the species; and that, therefore, the Guinea-worm is introduced.

No case, however, has yet occurred where a young *Filaria* of the free species has been found entering, or in, one of the sudorific ducts, so this is still an assumption; but having met with an instance in which young Filaridæ were found entering a fungus by analogous apertures on the surface, even smaller than those of the sudorific ducts, it seems desirable that the facts should be recorded to show that at least, in the vegetable kingdom, this kind of entrance takes place.

I have formerly stated that, the free microscopic Filaridæ chiefly frequent the gelatinous algæ for breeding, and also for food, and now I can add that myriads also accompany almost every species of large fungus for the same purpose. The number of microscopic worms, together with the larvæ of insects, to which the fungi give nourishment,

is incredible, and it was on the surface of a large species of *Sphæria* that I observed the fact to which I have above alluded, and of which the following is a description :—

While examining some specimens of the large digitiform *Xylaria* which grows on the decaying trunks of Tamarind trees, &c., some delicate, glistering, thread-like bodies were seen to project from the summits of the conceptacles (one from each), and to be waving with such an animal motion, that I thought it desirable to ascertain their real nature, so, having collected two or three on the point of a needle for this purpose, they were transferred to a little water on a glass-slide, and placed under a microscope, when they were found to be young Filaridæ,—but too undeveloped for their species to be determined.

The conceptacles are little globe-shaped sacks, imbedded in, and scattered over, the surface of the fungus, upon which they open by minute mouths or ostioles, respectively, which, when measured, were found not to exceed the 1-1880th part of an inch in diameter, so that they are smaller than the orifices of the sudorific ducts of the human body ; and from each of these ostioles was projecting a single *Filaria*,—the head in the conceptacle.

If, then, it be possible for these little embryo-worms to enter such small apertures for food in one organic being, it may fairly be inferred that others may do so in another ; and hence the possibility, if not probability, of the Guinea-worm in the human subject, being a monstrous development of a particular species of one of the free Filaridæ, which also enters the human body in an embryonal form for food, through the sudorific ducts ; assuming as before stated (that indeed, which is almost a certainty) viz. that the young of *Dracunculus* are too delicate to maintain an independent existence, and therefore cannot propagate the species, which must thus obtain its perpetuity and come, from some other source.

(Turning to another subject.—To those who are interested in seeing how the fungi follow in their propagation the law of all other organised beings, the species of *Xylaria*, to which I have above alluded, may form a beautiful example, for it presents on its surface conceptacles of two kinds, viz., one (the female,) bearing thecæ filled with sporidia, and the other (the male), bearing a bunch of filaments surmounted by spermatia or conidia. It is necessary, however, not to confound this *Xylaria* with another species of *Sphæria* which often accompanies it, viz., an *Hypoxylon*. The former is brown when fresh, dentiform, digitiform or clavate, with no definite internal structure ; the latter

blackish-brown, globose, convex, and sessile, presenting a concentric, laminated structure internally, and throwing off a dark-black, indigo-blue powder when mature, which consists of the sporidia. Both may exceed in size, the fingers and the fist respectively.)

"*Fungus-Disease.*"—Again, the black fungus described by my namesake (Dr. H. V. Carter), in the last number of the "Transactions" (No. VI.) which commits such devastation in the bones and soft parts of the feet and ankles, almost exclusively, and ultimately attains in spheroidal masses, the diameter of half-an-inch, may also, in an embryo-state, that is, in the form of a zoospore, like an *Amœba*, enter the body through one of the sudorific ducts; for microscopic examination of fresh, young, and favourable specimens of this undoubted fungus has led me to infer that, it is most nearly allied to the Mucorideæ, *ex. gr. Mucor stolonifera*, Ehr. (the black-headed, pin-shaped fungus, that grows over paste), which we shall presently see is most probably propagated in this way. This *Mucor* is closely allied to *Achlya*, which has been viewed by some as merely an aquatic form of it, so much are the two alike (*ex. gr.* the fungus which grows out from dead grass-hoppers and insects generally when undergoing decomposition in water). Closely allied to *Achlya*, again, are the "water-fungi" which grow in and out through the cells of all *Algæ*, to which I have long called attention in the Characeæ, &c. (Ann. and Mag. Nat. History, 1856), and which lately have been named by Pringsheim "Python" (Ann. des Sc. Nat. t. xi. p. 370, Bot. 1859. *Ex. gr. Python entophytum*, which breeds in and about the cells of *Spirogyra* after the latter has been removed from its habitat, and kept in a basin of water until it begins to perish). Lastly, all these are allied to the great fungus family of Myxogastres, for which now, the name of "Myxozoa" has been proposed by M. Antoine de Bary (Ann. des Sc. Nat. t. xi. p. 150, Bot. 1859); partly on account of their embryos or propagative germs being locomotive,—that is, polymorphic cells (minute *Amœbæ*), provided with one or two cilia, so that they can swim with the latter when in water, or creep about by means of their polymorphic moto-plastic cell when on wet surfaces (under the form of *Amœbæ*). Now *Mucor*, *Achlya*, *Python*, and the Myxogastres, all being allied to each other by this mode of propagation (that is, by minute amœbous or moto-plastic cells), we are not wanting in fungi which produce embryonal forms, that if any of them chose to enter the human body, they have the power, under the condition and circumstances above mentioned, to do so as easily through the sudorific ducts (or even directly, through the skin

itself, for they have wonderful penetrating power),—as an embryonal *Filaria*.

I would also add my opinion that the black fungus of the human body is a monster-form,—from its sporangia, or large cells apparently identical with sporangia, never to my knowledge, containing anything but an amorphous, albuminous mass—(abortive state of sporidia, which is chiefly the seat of the black colouring matter, and ultimately becomes resinous or fatty ?)—and thus that, this fungus is no more capable of putting forth a true embryo which can propagate the species from one human body to another or even out of the body, than the Guinea-worm; and that the natural habitat of the species is therefore, like that of the Guinea-worm, out of the body.*

It may perhaps be asked how I come to place *Mucor stolonifera* among the fungi which are propagated by polymorphic zoospores? My reply is, that I have met with a case in which many of the heads of *M. stolonifera* were composed of a mass of minute polymorphic cells *(Amœbæ)*, which, after having been placed in water on a slide, soon separated from their globular aggregation, and crept away from each other under moto-plastic forms, which forms, under other circumstances, I assume, would have respectively been surrounded by firm, sporidious capsules, and on the latter bursting in development, would have come forth as propagative, amœbous germs or embryos, like those which come from the sporidia of the Myxogastres, with which family Corda has already placed the Mucorideæ, though not probably from the

* I take from my "Note-book" the following short description of this fungus which on one occasion (28th September 1861), I examined half an hour after the amputation of the foot in which it was situated, with my namesake, who has the merit of having first pointed out its real nature in the "Article" to which I have above alluded, and to which I would direct attention for a more elaborate account of the disease, &c :—

Foot.—Greatly enlarged, presenting several small cloacal orifices connected with branched sinuses originating around globular, black or dark-brown masses, ranging in size, from microscopic minuteness to upwards of half an inch in diameter, situated *in* the bones and deep soft parts of the foot and ankle.

Black masses.—Globular, presenting a cauliflower surface and breaking up with a like structure radiating from the centre; composed of short, irregular filaments of concatenated, unequal sized cells, bearing on their sides and ends larger ones, (abortive spores ?) which at first are pear-shaped, but afterwards become globular, filled with a homogenous (albuminous ?) substance colored brown, which, swelling out the cell, appears to burst it, and thus becoming free, affords the principal part of the coloring matter and substance of the mass.

Iodine gives a deep claret color to the contents of the large cells (spores ?) indicative of their amylaceous nature, and a deep sherry or amber-color to the rest of the structure, among which I observed starch-grains that appeared to me to belong to the fungus.

The best portions for illustrating this structure, are the smallest and least colored, not those which come from the large dark masses, for they seldom present much beyond homogeneity and color.

circumstance just mentioned, but from their general resemblance.—(Corda, "Icones Fungarum," p. 19; and *Mucor stolonifera seu Rhizopus nigricans*, p. 20, tab. xij, fig. 83*).

No. 2.

On Hill Sanitaria and Climates in India, being a letter addressed to the Right Honourable the Secretary of State for India.—By C. Morehead, M.D., Honorary Surgeon to the Queen.

Presented September 1861.

Sir,—I have been favoured with a copy of a "Report on the extent and nature of the Sanitary Establishments for European Troops in the Bengal, Madras, and Bombay Presidencies," published by the Government of India, and forwarded to me through the India Office by desire of the Honourable Sir Bartle Frere, K.C.B.

2. At page 21 of the Report I observe that Sir Hugh Rose, in transmitting to the Government of Bombay my official Report on the Sanitaria in the Poona Division of the Bombay Army, makes comments which show that he did not rightly apprehend the principles which it was my object to inculcate, or the scheme by which I proposed to apply them.

3. As the right use of the hill climates of India is of the utmost importance to the welfare of the British soldier, it is very desirable that the question should not be rendered needlessly complex by diversity of opinion. I therefore take the liberty of addressing you with the view of re-stating in a succinct form the principles which I endeavoured to apply in my Report, and of showing that in truth there is no real difference of opinion between Sir Hugh Rose and myself.

* Familiar examples of these Fungi are given that the reader may the more easily procure them for examination. Abundance of the Myxogastres may be found on the dead wood in the building-timber and fire-wood yards during the Monsoon; among which is the *Æthalium* or "creeping-fungus," which, under the microscope, by transmitted light, affords one of the most wonderful objects in the world. To obtain this, look among the chips and saw-dust of the astringent woods during the "Rains," and having found a yellow or brown colored slime, take a piece of it, about half the size of a pea, and place it in a watch-glass with a little water; afterwards put the glass in a shaded or dark place for a few hours, when the *Æthalium* will, if young and fresh, have passed into an arborescent form fit for observation.

4. The following are the principles included in my Report :—

1. The cold season—from the middle of November to the end of February—throughout India is, speaking generally, not adverse to the European constitution.

2. The hot season—from the beginning of March to the middle of June, and the month of October—may be said in general terms to be more or less injurious to the European constitution throughout India below an elevation of about 4,000 feet.

3. The rainy season of the south-west monsoon—from the middle of June to the end of September—is from humidity, heat, malaria, or cold more or less injurious to the European constitution in most parts of India at all elevations. There are, however, some remarkable exceptions, the chief of which is, that part of the Deccan table-land situated between 20° and 15° N. latitude within 60 miles of the eastern side of the Western Ghauts, and with an elevation of from 1,700 to 2,300 feet.

4. The cold season—from the middle of November to the end of February—being throughout India suitable to the European constitution, is that to which the movement to and from Hill Sanitaria should, as far as practicable, be restricted.

5. The hot season—from March to the middle of June and the month of October—throughout India in all localities below about 4,000 feet (that is, within the influence of inland hot winds or the relaxing heat of the Coast) should, as far as practicable, be avoided.

6. Localities in which the rainy season—from the middle of June to the end of September—is unfavourable should, as far as practicable, be avoided.

7. The cold season of hill climates in India is unsuitable in forms and stages of disease, for which a change to the sea-coast is often very beneficial.

8. Two great defects have hitherto existed in the application of Indian Sanitaria—

(*a*) The exposure to the cold and rainy seasons of hill climates of convalescents from forms of disease for which these seasons of these climates are unsuited.

(*b*) The neglect of sea-coast sanitaria for convalescents in the cold season for whom the cold season of hills and of inland table-lands is unsuited.

9. If from among the convalescents at stations with unfavourable hot and rainy seasons a judicious selection be made of those appropriate to a hill climate, and their arrival at the hills station be timed so as to

occur early in Mareh, then a residenee of one hot season (ineluding Oetober) on the hills, and one rainy season in a suitable loeality, will in general be suffieient to fit such convaleseents for return to duty in the sueeeeding cold season.

10. The hill climates are not merely to be regarded as conducing to the reeovery of suitably selected convaleseents, but also as, when taken in eonneetion with a suitable monsoon climate, materially assisting in maintaining, at a higher standard, the general health of European soldiers and their families. This object may be effected by transmitting, towards the end of February of each year, such percentage of the men and families of every regiment as the eontingencies of service may permit to a hill and suitable rainy season climate, and returning them to their stations in the sueeeeding eold season. Thus every soldier in India with his family would periodically, and in rotation, more or less frequently, aeeording to the available percentage, be saved from the deteriorating influence of the injurious seasons of India.

11. In order to provide for the wants of the sick and eonvaleseent, from those forms and stages of disease for whieh the eold season of the hills and inland table-lands is unsuited, sanitaria, on earefully seleeted positions on the sea-eoast, should be established.

12. These prineiples admit of easy application in the Presidency of Bombay, as is shown in my official Report, and also, though in less degree, in that of Madras. But in Bengal and the Punjaub they are beset with diffieulties whieh doubtless further inquiry and observation may most materially abate; and it is most desirable that no effort with this view should be spared, for it may be safely affirmed that they are the only sound prineiples deduciblc from past experienee and proved physiologieal data.

13. On the question of aeclimatation there ean be no doubt that the longer and more eontinuous the exposure of the European to the adverse action of high temperature, exeessive humidity, and malaria, the greater will be the deterioration of his eonstitution. Therefore, as respects *these* influences, there is no sueh thing as benefieial aeclimatation. But when the change is made from Europe to India, that is from a temperate to a tropical climate, then the eonstitution of the European undergoes a modifieation, in order that the various functions may be brought into harmony with the influence on them of eontinued high temperature. There are few faets in physiology more satisfactorily

proved than this. It is a true acclimatation. It is perfected in a short space of time in one cycle of the seasons. If the arrival in India has taken place in the cold season, then with ordinary care as regards diet, dress, exposure, exercise, &c., this modification of the constitution, this acclimatation will be insensibly effected, and the European, at the commencement of the second cold season, that is after a year's residence in India, will have become acclimatised. But if arrival should take place in the hot season, or if there should be excesses in food, intemperance, undue exposure or fatigue, then forms of febrile disease or biliary derangement are readily excited, and these, in common language, are correctly enough termed *seasoning diseases*. But this rude process of acclimatising Europeans to an Indian climate not only for the time fills the hospitals with sick, but leaves the men shattered in constitution, and predisposed to the serious forms of tropical disease. With a good sanitary system it ought to be of very rare occurrence.

14. In organising a sanitary system for the British soldier in India, the truly practical aim is not to give him that state of constitution which he would have in his native country, for that is incompatible with the contingencies of military service in India. The object ought to be to maintain him in that condition which best fits him for the maximum of efficient service with the minimum sacrifice of health and life, by as far as practicable protecting him from continuous high temperature, malaria, and the other various agencies which deteriorate health. This is to be effected by a careful selection of sites for cantonments, good construction of barracks, a systematised use of hill, coast, and healthy monsoon climates, with assiduous attention to the other various conditions which are now so well known to conduce to the maintenance of health. Therefore, to place permanently at such elevations as Octacamund, on the Neilgherry Hills, all the British troops in India, even if politically practicable, would not prove, in my judgment, the best method of fitting the European soldier for the maximum of efficient service with the minimum sacrifice of health and life. Doubtless Europeans permanently residing in a hill climate such as Ootacamund would retain much of their native vigour, but they would not be efficient for the contingencies of military service in India. If suddenly called to the plains for service in the hot season, there would be a heavy sick list from seasoning fevers and biliary derangements, and a rapid loss of vigour and stamina would result. Then, the service over, and the men exhausted by heat, fatigue, and sickness, moved back to their hill cantonments, would be subjected to much mortality and invaliding from these forms

of disease, for which the cold and rainy seasons of hill climates are unsuitable. Were it possible to transport *in a few hours* troops from the camp at Aldershott to the plain of the Ganges any time between March and November, use them for active service, and return them broken in health *in a few hours* from India to Aldershott any time between October and May, the result need not be told. It would be analogous in kind to that which may be anticipated from the permanent location of troops in such positions as Ootacamund and the interior Himalayas, and their rapid transfer any time between March and November, in the one instance to Malabar, the Concans, or Carnatic, and in the other to the plains of the Punjaub or of the Ganges, with their return to their hill cantonments between September and April. In both these instances I have assumed the hill position to be *above* the force of the south-west monsoon, as at Ootacamund, or *beyond* it as in the interior Himalayas; but should it be open to the force of the south-west monsoon, as at Mahableshwur, or on the sub-Himalayan hill ranges, then the unfavourable period for return to the hill stations would be between November and March, and again between the middle of June and the end of September.

15. In consequence it would seem of my report, dwelling on the injurious action of the cold season hill climate in certain forms and stages of disease, appropriating the cold season—suitable in all parts of India—to the transfer to and from the hills, and limiting the soldier's absence from duty to one hot and one rainy season, Sir Hugh Rose has erroneously assumed that I am not familiar with the fact that the cold season at Mahableshwur is invigorating and useful to Europeans without organic weakness, more especially if not long resident in India. His Excellency has further overlooked that the period of his personal experience, viz. from 20th October to the middle of November, is included in the time recommended by me for the European soldiers, as may be seen by reference to the 26th and 31st paragraphs of my report. Moreover, it does not appear from Sir Hugh Rose's letter, dated Mahableshwur, 30th April 1859, that at that time he had any personal experience of what in my report is termed the "cold season," viz. from the middle of November to the end of February, and which it need hardly be remarked differs materially in many characteristics from the season between 20th October and middle of November. I regret a seeming difference of opinion with a high military authority on a matter of so much importance as the health of the British soldier in India; the more so in this instance because it might easily have been avoided. On

the 30th April 1859, the date of Sir Hugh Rose's letter, I was either on the Mahableshwur Hills, or within an easy march of them, and a few minutes' conversation, or a note of reference from His Excellency, would have enabled me to remove the misapprehension under which he laboured.

16. It may be well that I should explain more fully why I have not included the cold season in the period of residence recommended for the European soldier at Deccan hill stations—

1. The cold season throughout India is suitable for the European, and is the only season appropriate for the return of men from hill sanitaria to stations in the low country.
2. If only cases suitable for a hill climate be selected, and the use of hill climates be systematised and judiciously practised, absence from stations in the plains for one hot and one rainy season periodically repeated will be sufficient.
3. As the cold season of hill climates is injurious in some states of constitution, there would always be a risk of a proportion being retained during that season to their injury rather than their benefit.
4. Without a system of employment and amusement far more perfect than any yet thought of, a two years' residence at a hill station most generally proves tedious and depressing to the soldier.

17. But doubtless exceptional cases will occasionally present themselves for which a continuance on the Mahableshwur Hills during the cold season may be useful. If so, there is nothing in my proposed scheme incompatible with their detention,—it being, however, remembered that on no account should they be returned to their station and to duty in the low country before the opening of the succeeding cold season, and that therefore it will involve an absence of two years from duty instead of one. It should be further borne in mind that this exceptional proceeding, if largely practised, will necessarily have the effect of lengthening the interval of the soldier's return to the healthy climates, and of increasing the continuity of his residence in the unhealthy ones, and therefore operate disadvantageously on the army at large.

18. In conclusion it may be confidently anticipated that the regular and systematic use of hill, coast, and healthy monsoon climates in accordance with principles similar to those suggested in my report, and re-stated in this letter, in connection with a never-failing attention to the position and construction of barracks, to the dress, rations, duties,

amusements, and the other various matters of detail which relate to the health and comfort of the soldier, must in a few years have a marked effect in reducing the proportion of sick, of mortality, and invaliding in the British army serving in India.

I have the honour to be, &c.

C. Morehead, M.D.,
Surgeon Major, Bombay Establishment.

12 *Vernon Place, Scarboro, 17th September* 1861.

No. 3.

Selection of Cases from the Records of the Kurrachee Charitable Dispensary.—By Sub-Assistant Surgeon Bazunjee Rustomjee.

Presented December 1861.

Case No. I.—*Fungus disease of the left foot, white variety.*

Kullian, age 40, caste Hindoo, native of Jurodhur, 32 miles from Bhooj. Duration of disease three years. Occupation partly agricultural and partly begging. Admitted 24th June 1861.

The left foot is four times larger than the right; its dorsal surface is irregularly swollen, rendering the whole outline of the tarsus and metatarsus obscure. The toes only remain distinct. The skin is congested, and bears three or four prominent soft elevations on the surface. The sole and sides of the foot are beset with numerous sinuses which discharge purulent or sanious matter, containing at times white granules. A probe can be passed to some extent through one of these sinuous openings till it is interrupted by hard osseous structure in the interior. The skin is preternaturally soft, and has an unhealthy whitish look; over the metatarsus and phalanges it is healthy; a portion of integuments over the heel is also healthy.

The disease commenced as a hard, painless tumour on the plantar surface of the foot just above the healthy skin of the phalanges without any wound or injury of the part some three years since, and gradually invaded the other parts of the limb. He further states that there was no pain or discharge for the first two years, and it progressed rapidly to its present condition on the application of medicines.

The patient seemed to be perfectly familiar with the white granular masses which had already come on the surface, as he picked up a couple of them from two different parts of the dorsum of the foot. The nature of these peculiar yellow pulpy bodies has been recently satisfactorily demonstrated by Professor H. V. Carter, according to whom the white particles are composed of a collection of fungi with crystalline matter of a fatty nature, a single granule containing dozens of fungi which have a beaded cellular filamentous appearance under the microscope. Each granule is composite, being made up of the aggregation of many, sometimes a dozen, separate particles. The fungi and crystalline matter which has, according to Professor Ballingall, who first described it, a fringed coat under the microscope with oil globules are the chief characteristics of the disease. The instance now described belongs to the second or white variety of Dr. Carter, whose masterly researches have acquainted us with the pathology of the disease.

The patient, an opium-eater, as it is generally the habit with the Charon tribe and others in Kutch, was willing to submit to operation, but he was at the same time eagerly desirous of proceeding to his native place, as it was the closing of the fair season, and consequently he could not be pursuaded to stay in Kurrachee, although I promised to pay the expenses of his passage to Kutch.

He was in an emaciated condition, but in fair good health; had never any venereal disease, and no symptoms of scrofula.

Case No. II.—*Fungus disease of the left foot, white variety.*

Mathoora, age 57, occupation confectioner, caste Hindoo, Pokerna Brahmin. Duration of disease six years. Native of Kurrachee. Re-admitted 26th September 1861.

From a little above the ankle down to the line of Hey's operation, the left foot is globularly enlarged. The skin is beset with large fungoid granulations or sinuous openings which discharge purulent matter, containing from two to four granular bodies every day. The foot measures 19½ inches in circumference. The fungoid granulations are in greater numbers on the heel and on both sides of the foot immediately below it. The skin on the dorsum from the toes to five inches upwards is healthy; that on the plantar aspect is normal to its extent, except a small portion in the centre of the internal and external borders of the foot. The ankle-joint is embedded in the globular mass, and its integuments participate in the lividity of the tarsus.

The disease commenced as a painless tumour on the inner side of the foot below the malleolus six years ago. At intervals of every four or six months severe pain was felt in the part; two years afterwards the granular discharge began to appear, and the disease invaded the outer side of the limb within the last twelve months. Says he had applied at the Dispensary three and a half years ago, when topical applications were used. Was salivated by a Bhatia Vuyd seventeen months ago, and about two years since an incision was made in the diseased part by a barber. Has never had syphilis or gonorrhœa. Has never been out of Kurrachee except once to Narainsir and Bhooj for a period of one mouth some thirty years ago. Has no recollection of the hereditary existence of the disease in his family, whose male members follow the occupation of confectioner through a long pedigree. Is an emaciated old man, with a pale dejected countenance caused by long suffering from the disease. No symptoms of scrofula and consumption. Gets febrile attacks occasionally. Had applied for relief in the early part of August last, and has again, but with a too timid resolve to submit to amputation.

In my notes on cases of "Diseased Foot," submitted two years ago, the prevalence of the disease among farmers who, more than any other class of men, are predisposed to the disease was apparent. Dr. Carter alludes to the opinion entertained by Professor Ballingall and Dr. Colebrook about the liability of cotton-field labourers to suffer from the fungus disease. My belief is that not only do the cotton-field labourers but farmers and others engaged in the growth of vegetables and the cerealia also suffer from the disease. Moreover, the case now described with others I have seen conclusively provided that spores of the fungi might find entrance into the foot without the sufferer exposing himself to any sort of field labour.

Case No. III.—*Fungus disease in the early stage. Diagnosis doubtful.*

Khaitbaee, age 13, female, caste Hindoo Loharra, native of Nuro, 40 miles off Bhooj in Kutch. Duration of disease six months. Admitted 7th July 1861.

Has a small nearly circular ulcer on the outer side of the sole of the right foot about an inch from its external margin. The ulcer, or rather opening, discharges thin sero-sanguineous matter, which apparently comes from the deep interior of the sole. The skin surrounding

the opening, which is about the size of a quarter of a rupee is inclined to dark-grey colour. Above the opening and just at the inner margin of the sole is a hard lump of thickened integuments and areolar tissue. Says the disease commenced six months since with a thickening of the skin on or near the seat of the present ulcer. That on her way to Kurrachee *viâ* Mandvee, while embarking on board a kotia (Kutch vessel), she was injured on the spot with a sea-shell which caused the present ulcer that has never healed since. The discharge is either purulent or sanious. Her father, an old man of nearly sixty, says he never sent her to labour in the fields, and is himself a grocer on a small scale. She is in excellent health. The rest of the foot is sound and normal in appearance. No scrofula; walks on her heel with the toes raised from the ground.

9th July.—A portion of the integuments near the ulcer has given way, and a small ulcer covered with thick pus is observed on the spot; from the lower side of the ulcer thick fœtid purulent matter oozes out. The thickening of the skin and areolar tissue extends to two inches from the inner margin of the ulcer, and is continuous with the lumpy hardness on the inner edge of the sole of the foot. She absented herself the next day.

The question is, is it a case of commencing fungus disease? I am inclined to view it as such, though I have expressed my doubt as to the correctness of my diagnosis. There is evidence of the way in which the fungus disease often begins, and there was the presence of the characteristic indurated lump, and deep sinuous opening. If these are the signs of the early stage of the fungus disease (and such they were; but with others more characteristic in the only case of early foot-disease, detailed by me in my previous notes), then no doubt could be entertained as to its nature; but in the almost entire absence of recorded instances of the early stage of the disease, the absence of a microscopic examination of the tissues involved, and the absence of any visible granular particles in the discharge, the diagnosis cannot be stated with certainty.

CASE NO. IV.—*Stone in bladder. Lithotomy. Tube not used. Recovery.*

Noor Mahomed, age 33, caste Mussulman Puttan, native of Candahar, occupation shoemaker. Duration of illness two years. Admitted 28th October 1861.

13*th November*.—Was prepared for the operation up to yesterday. This evening chloroform was administered at 3 o'clock, and the lateral operation of lithotomy performed. The stone easily extracted weighed 90 grains, and was of the mulberry variety. The sound striking against the irregular prominences of the stone gave the fallacious impression of the existence of more than one calculus. The bleeding was pretty free, but the perinæum being deep, it was not easy to make out whence it came; consequently the wound was injected with cold water which checked the bleeding in a few minutes; in the absence of a properly constructed tube, the wound was left alone.

From the date of the operation nothing unusual occurred. The urine passed freely by the wound, and on the third day part of it came by the urethra, since which it continued to appear by both the channels, and on the ninth day almost the whole of the secretion took its exit by the natural passage, and the wound was healing fast. By the end of November scarcely any urine escaped by the wound which had healed, and he was discharged well twenty-one days after the operation.

Case No. V.—*Stone in bladder. Lithotomy. Non-insertion of Tube. Recovery.*

Name Peerdad, age 18, occupation labourer, native of the Khelat Puthan. Duration of disease eight years. Admitted 24th May 1861.

12*th July*.—As he was a spare man, and the presence of stone was attended with great irritability of the bladder, preparatory treatment was used up to yesterday. This evening an attempt was made to bring him under the influence of chloroform, which he took badly. The administration of the anæsthetic was attended with difficulties, the bladder contracted thrice, and it was necessary to inject tepid water as many times; more than 11½ fluid drachms of chloroform were consumed, although it was administered by the practised hand of Dr. John Bean, the Civil Surgeon, without whose very valuable and able assistance I could not have finished the operation. The internal incision having been made, the patient struggled, and so the internal incision was very nearly being made in a wrong direction; but at length the groove was regained, and a short incision made in the prostate, the stone grasped and extracted without trouble. It was a mulberry calculus, and weighed 5 drachms. No tube was inserted in the wound.

6 P.M.—Vomited the opiate given him after he recovered from the effects of the chloroform. Is restless. To have another opiate at bed-time.

13*th*.—Slept indifferently. The urine passes by the wound. No bleeding; vomited first early in the morning; has febrile heat of body. Ordered mist. diaphoret. ℥iss every 4 hours, thrice, and linseed tea. *Vesp*.—Some urine by the urethra; the wound covered with a little lymph. Has much febrile heat. Complains of pain in the belly, particularly in the hypogastrium. The opiate to be repeated at bed-time.

14*th*.—Did not sleep much. Has less fever than last evening. Bowels not opened. Urine through both passages. Coating of lymph on the wound. Continue the morphia. *Vesp*.—Fever more than in the evening. Does not like the linseed tea. Repeat the opiate.

15*th*.—Had some sleep in the night. Bowels not moved. Pain in the region of the bladder less, but there is some hardness and tumefaction around it. Urine passed twice in the night through both passages. The mixture to be continued; the belly to be fomented, after applying turpentine and tinct. opii twice daily.

16*th*.—More urine passes by the urethra than by the wound. Slept well. Order castor oil ℥iv.

17*th*.—Feels better. To take chiretta and acid thrice daily. Wine ℥ ii.

18*th*.—Makes no complaint. Cont.

19*th*.—Sleeps well. The whole of the urine passes by the urethra. Wound granulating, but not opened. Small bed-sore on the sacrum. Castor oil ℥iv.

2*nd August*.—The wound entirely healed. Attends at the dispensary and picks up strength.

These cases are introduced to show the difference of time in the appearance of the urine by the urethra in lithotomy operations, when a tube is inserted or not in the wound. In these two cases the urine first appeared by the urinary channel before the expiration of 48 and 24 hours respectively, and continued to flow partly by the urethra and partly by the wound till the eighth and ninth day, when the whole of the urine took its exit by the natural passage. In ordinary cases when a tube is inserted in the wound, the urine appears by the urethra on the second day when the sides of the tube are clogged with lymph, but it flows again by the wound when the tube is withdrawn and appears by the urethra in part on the ninth day, and the whole of the fluid does not generally find its way by the urethra till the middle or end of the third week. I make this latter statement on the faith of what I have seen of Professor Ballingall's practice during my attendance in the Surgical Wards of the J. J. Hospital. In his notes on Lithotomy, published in the Medical Transactions for 1852-53, Mr. Bhawoo Dajee, who, I believe, has

the largest experience of Lithotomy among the Graduates of the Grant College, states that the urine appeared in part by the urethra on the ninth and eleventh day in his first and third case. The urine took the same course in five operations for stone in the bladder which I had to perform before the two narrated above, and where a tube was introduced into the wound. Professor Fergusson makes the following statement in the 3rd edition of his Practical Surgery :—" Usually from the swelling of the parts in the track of the incision the urine passes freely by the urethra on the second and third day, but it soon again all escapes by the wound, then on the eighth or ninth or tenth it flows in part by the natural course, and in a few days more is entirely evacuated through this channel." But as above stated, the urine follows a different course when the tube is dispensed with. The reason of the earlier appearance of the urine by the urinary channel in the latter case is evident enough. The wound is not irritated by any foreign body, and its sides are in better apposition, and consequently in a state favourable for the contraction of the wound. Whereas when a tube is introduced, the sides of the wound are dilated and put upon the stretch for two days, and so the closing in the wound proceeds comparatively slowly. Thus it is advantageous not to use a tube when lithotomy is properly performed, the prostate cut to a limited extent, and when there is no danger of hæmorrhage or extravasation of urine. But in instances when the operation is clumsily performed and the danger of hæmorrhage and extravasation are impending, it is better not to dispense with the tube. In children I should think the use of the tube indispensable. The experience of two cases is limited and requires confirmation.

Case No. VI.—*Extensive contused and lacerated wound with compound comminuted fracture of the forearm and arm. Amputation. Death.*

Hajee Abbos, age 34, beggar, Puthan, native of Cabool. Duration of injury nine hours. Admitted 12th May 1861 at 3 P.M.

Bitten by an alligator at Muggur-Peer at the morning-prayer time, while he was engaged in offering his prayers. The left forearm is extensively lacerated ; the muscles, blood-vessels, and nerves fearfully torn asunder ; the elbow-joint is exposed, and the head of the radius separated from its joint. The ulna is also splintered about an inch below the joint. Higher up and on the same side about two inches and a half below the shoulder-joint the humerus is fractured into splinters.

Another inch further down, the bone is comminuted into pieces, and the muscular substance greatly smashed. The accident happened early in the morning, and much blood was lost before he was brought to the Dispensary. He is of robust body, but in a state of profound shock. There was hardly room enough to obtain good large flaps, and in consequence circular amputation of the arm was performed after administering of wine 6 ozs. and chloroform. He died at 4 A.M. on the 13th May 1861.

As a rule, amputation must not be performed while the patient is in a state of shock. But here the injury was so extensive, and the quantity of blood lost so great, that there was no prospect of the patient rallying soon, and the operation itself was not calculated to add to the shock already present. Professor Erichsen states that "in some cases, however, the presence of a crushed limb appears to prolong the shock, and thus prevent the patient rallying, notwithstanding the administration of stimulants. Under these circumstances the Surgeon would be justified in operating before reaction came on."

NOTE.—Muggur-Peer is situated about 10 miles from Kurrachee, and contains hot springs and reservoirs, where alligators abound in numbers and are fed on animal food by Hindoo and Mussulman votaries, who regard the place and the horrid creatures with religious reverence.

CASE NO. VII.—*Extensive contused and lacerated wound of the right forearm. Death from traumatic spreading Gangrene.*

Soomar, aged 13, caste Mussulman, no occupation, resident of Kurrachee. Duration of injury three hours. Admitted 13th September 1860.

Brought to Dispensary at 5 P.M. by Foujdar's men with a severe and very extensive contused and lacerated wound of the right forearm. The whole of the skin, as well as the muscular substance from an inch and a-half above the wrist up to the elbow-joint was laid bare, and the blood-vessels, nerves, and subjacent muscular parts were exposed. There was bleeding from the small vessels, but no large artery was injured. He had also a contused wound on the head just behind the left ear. The wound on the forearm is more than four inches long, and its greatest breadth is about an inch and a-half. No fracture or any other injury of the limbs. Is quite sensible. The injury happened by the sharp edge of a cart coming against the part. Chloroform was given, the particles of sand and dust removed, and the wounds stitched, and straps and water dressing applied.

Fever came on the next day, and on the third day gangrene commenced in the form of bullæ, and in three days more it spread below as far as the fingers and upwards above the elbow-joint; stimulants, tonics, and wine were administered, but he died of prostration from the effects of the spreading gangrene on the morning of the 19th, *i. e.* on the fifth day after the receipt of the injury.

The question of amputation in spreading gangrene presented itself in the case. The injury was not sufficient to account for the disease, which was undoubtedly due to a constitutional defect. The line of demarcation had not formed, death ensuing previous to its formation. Professor Erichsen advises the performance of the operation notwithstanding the liability of stump to turn gangrenous. But acting on the advice of Professor Ballingall that in India the knife is viewed with suspicion, and death unreasonably ascribed to its use, I did not perform the amputation. Dr. Bean, the Civil Surgeon, who was consulted when the gangrene set in, did not advise the use of the knife.

Case No. VIII.—*Worms in the Nose, or "Punosh."*

Mahomed Ally, aged 28, petty trader, Mussulman, native of Sheewan in Sind. Admitted 9th April 1861.

Is of spare habit of body, with pale, blanched features. Says the disease existed for three days before admission, when he complained of pain in the nose, eyes, and face. He had discharged blood from the nostrils the day before admission, and passed about 20 or 25 worms from them. The worms according to the patient's account were small and like thread. The nose is flattened and snubbed a little at its tip and nostrils, but more prominent and larger than in health. Feels pain on pressure. There is ulceration in both nostrils. No ulceration in the mouth or palate. Tongue preternaturally clean. Breathes with difficulty. Has some febrile heat. Pulse small and quick. Ordered turpentine and water injection in the nostrils. Mist. diaphoret. ℥iss every 4 hours, 3 times daily.

10*th*.—The next day no worms were reported to have been discharged, but the discharge of blood continued, and the nose, eyes, and face were more swollen, and pain in the teeth was complained of. Has some fever. Diaphoretic mixture to be continued. The nostrils to be syringed with alum lotion. Pulv. Doveri. gr. x. h.s.s.

11*th*.—Passed about 15 worms yesterday; bleeding from the nose less; the pain more severe, particularly in the mouth. Swelling of the nose

much the same. No sleep; fever slight; tongue clean, with slight furr; bowels not moved. ℞ mixt. diaphoret. quinæ ā ā ʒiii. tinct. opii ʒ ss ft. mixt. ʒii ter. in die.; continue syringing the nostrils. He ceased attending after the 12th April.

The patient brought to me some of the worms expelled last time. They were small, from $\frac{1}{3}$ to $\frac{1}{2}$ inch in length, with knots and intervening rings which numbered from 10 to 12 in each worm, and there were dark points at the head and tail of each worm. They were similar to worms observed by me in a case admitted in the dispensary last year and detailed by me in the selection of cases for that year. The worms were kept in spirit and forwarded to Professor H. V. Carter of the Grant College Museum.

Case No. IX.—*Hypertrophy of certain bones of the upper and lower extremities at particular points.*

Looper, a Mussulman boy, aged 13, and native of Meckran, was admitted on the 12th September 1859 as an out-patient of the Charitable Dispensary when the following note was made :—

"The right humerus is thickened above the elbow-joint to the extent of an inch. There is small swelling of the ulna a little above its middle. The tibia of the same side is considerably thickened at its middle; also a slight swelling below the knee-joint. On the left side the humerus is curved and thickened from below its middle to the elbow-joint and the tibia is thickened below its tuberosity. The left clavicle is thicker than the right."

On inquiring into the history no important information was elicited, but the boy said the state of the bones existed for the last three years.

The hypertrophy of the bones at various points is, I believe, due to a local determination of blood during the growth of the epiphyses, and the thickened state of the clavicle is also due to the same cause, coupled, perhaps, with a greater exercise of the arm, causing greater development of the collar-bone. Whatever may have been the cause, the state of the bones was as above noted.

Case No. X.—*Disease of the left foot (cancerous).*

Name Soomar, aged 25, caste Mussulman, native of Sheewan in Sind. Admitted as an in-patient on the 26th September 1859.

On the outer side of the left foot immediately above the pointed projection of the fifth metatarsal bone is an enlargement about 1½ inch, raised above the general level of the foot, and four inches in circumference.

The skin on the top of it is ulcerated and congested, and livid over the rest of its surface. In the midst of the ulcerated spot are two small elevated granulations: the whole surface discharging a fœtid semi-sanguineous fluid. The swelling is apparently immovable from the deeper parts, and the skin is well adherent to the body of the tumour which is hard to the feel. No pulsation observable. Feels great pain in the swelling. The rest of the foot is apparently healthy.

Says that about five years ago he received an injury of the foot by a hatchet having struck it. Since then a small tumour appeared in the site of the present swelling and has been gradually increasing ever since. He is in tolerably good health. Charcoal poultice to the tumour; opiate at bed-time.

27*th*.—No fœtor from the surface of the tumour, which continues to discharge the bloody liquid. Complains of pain in the limb. Turpentine dressing and bandage.

Vesp. Seen with Dr. J. Bean, the Civil Surgeon. On my placing a finger on one of the prominent granulations on the surface a piece of bone was easily removed from it. To have his opiate. The extraction of the piece of bone left no doubt as to the seat of the disease. It was clearly a case of diseased foot, probably confined to the os calcis and astragalus. But a doubt hangs over its nature—whether cancerous or otherwise. The history of the disease beginning after an injury, the fungous appearance on the top, the congested and adherent skin around it, and the presence of great pain with bloody discharge led me to believe it was one of the cases of the so-called Osteo-encephaloma. It had no resemblance to the fungus disease of the foot I have observed.

The patient was willing to submit simply to the removal of the tumour, but knowing the disease to be deeper seated, Dr. Bean and myself persuaded him to submit to Syme's operation, but he did not like to lose his foot for what he thought to be a circumscribed affection, and he left the dispensary at night-time.

No. 4.

Case of Hydatids of the Liver evacuated through the Lungs.—By W. Hanbury, Esq., Surgeon, 33rd (Duke of Wellington's) Regiment.

Presented September 1861.

Dr. Watson in the third edition of his Lectures on the Practice of Physic, vol. 2, pages 538 and 539, relates the history of a case of Hydatids of the Liver, which were discharged by the lungs and bowels, and so full of interest does he consider the case, that he concludes his account of it with the remark that it "deserved to be recorded in more complete detail."

That hydatid cysts are seen most generally in the liver is of course well known, as also the fact that they sometimes lead to the formation of abscess, and are thus discharged through the walls of the abdomen. I have not yet, however, during my experience of ten years among British troops in India met with more than one instance in which these cysts were evacuated by the lungs, and as this case forms almost an exact parallel to that recorded by Dr. Watson, it is unnecessary, while supported by his example, to offer any apology for its publication.

G. G. proceeded to Aboo with his company on duty in October 1860. On the 9th May 1861 was attacked with what were considered symptoms of colic, but subsequently admitted under the head of hepatitis. On return to Deesa from the hills early in June, a report was received from the Medical Officer in charge of the Sanitarium at Mount Aboo, stating that he was "admitted with colic caused by the passing of gall-stones, and constipated bowels, pain occurring at intervals in the epigastrium extending to the right hypochondrium and the back, which terminated in inflammation of the liver." After his arrival on the 14th June at Deesa he was detained three weeks in the regimental hospital, during which period he suffered from paroxysms of pain for several hours on different occasions, was pale, weak, and emaciated, affected with irregular bowels and bleeding hæmorrhoids, but examination of the dejections frequently repeated, failed to detect gall-stones.

On the 3rd of July he was discharged from hospital and placed on the convalescent list, but on the 14th of the same month was again admitted as he did not appear to regain strength. From this time he

continued under treatment till the 13th of the following month, complaining frequently of attacks of pain in the right side of a severe writhing character, and lasting for a few hours, short and embarrassed breathing, fatigue on slight exertion, diarrhœa, &c.; but on the evening of that day he called my attention to some fluid which he had expectorated during the day, and on examination five or six broken cysts were observed from which the fluid was derived, and which it seemed more than probable were detached from the liver and evacuated through the lungs.

The report continues—

August 15th.—Has expectorated more of the fluid matter with a few cysts, the latter like grape or gooseberry skins, and tinged with bile. No additional constitutional derangement.

August 16th.—Vespere. This evening expectorated rapidly about a quart of fluid, floating innumerable cysts, more or less tinged with bile, from which this fluid matter had escaped. A few of these hydatids (though none of the larger ones) were found unbroken, about the size of a small grape, and filled with a liquid of an opaque colour somewhat resembling that occasionally seen in an addled egg, though not so dark, and of less consistence. In the efforts to evacuate these cysts he was much prostrated, and I found him sitting up, breathing with distress, and covered with profuse perspiration. On examining the chest rhonchi were heard over the base of right lung posteriorly, while over the left respiratory sounds presented nothing abnormal. About an ounce of dark grumous purulent-like discharge, derived from the right lung, was expectorated with the contents of the hydatid cysts. Wine was now administered to the extent of a few ounces, and a bandage was applied to support the abdomen.

August 17th.—During the night expectorated more than a pint of the same sort of fluid, though containing fewer cyst walls, but a much larger admixture of bile, which renders the matter of a green colour; has recovered from the exhaustion of last evening. The pulse is now of some volume, and he expects to be able to eat something for breakfast.

August 18th.—Improvement is noticed, and he is able to sit up; has expectorated about a pint of thin bilious fluid without cysts and free from purulency.

Vespere. Progresses favourably, and got off during the day about half a pint of dark-green bilious-looking fluid.

August 19*th.*—Little change is observed in general appearance, but he is yet weak and much reduced. Expectorated since yesterday about 4 ounces of tenacious mucus sputa with some degree of purulency.

August 20*th.*—Continues in the same state generally, and has expectorated about 5 ounces of muco-purulent fluid of a bitter taste.

August 21*st.*—Last evening the sputum was still muco-purulent and tenacious, but during the night this ceased to be coughed up, and he expectorated in its place about a pint or more of dark-green bile; pulse is soft and equable, and skin moist, spirits good, and appetite moderate. Yesterday auscultation elicited posteriorly a strong tubular sound in the act of coughing. From this date the improvement was steady and progressive, and the reports henceforward were less frequent.

August 23*rd.*—Expectoration continues copious; a tenacious mucus with slight trace of pus; once since last report half a pint of bilious-looking bitter fluid was coughed up; pulse is soft, and strength holds up.

August 29*th.*—General health has steadily improved, and his appetite is tolerably good, while there is no febrile excitement; has expectorated from half a pint to one pint daily of mucus with slight admixture of pus and a tinge of bile, and occasionally thin fluid bile.

September 6*th.*—No new features have been presented; health improves, and expectoration is somewhat less, and quite free from purulency, but still contains bile in more or less quantity; this is so bitter that violent coughing comes on, and breathing is almost suspended when a little of it finds its way into the œsophagus, while it is speedily ejected thence by vomiting.

September 14*th.*—Continues to improve, but he still expectorates a tenacious mucus mixed with bile to the extent of half a pint daily.

September 20*th.*—Expectoration decreases daily in amount, and now seldom contains a trace of bile; has gained seven pounds in weight since the 7th of the month.

September 27*th.*—No new symptoms are presented. He gains both weight and strength, but still expectorates mucus, which is occasionally tinged with bile.

October 6*th.*—There is now scarcely any expectoration of mucus or bile; general health is excellent, and he has gained six pounds in weight since the 20th September; but without following the case into further detail here, I may observe in conclusion that it is intended to recommend him to the Annual Invaliding Committee for change of

climate to England, as there is considerable deficiency of respiratory murmur with some condensation at the base of right lung, and he is not likely to be fit for the performance of active or laborious duty for some time to come.

It will be noticed that the subject of this case was admitted in the first instance under the head of colic, and that he suffered before the hydatids were dislodged, periodically from paroxysms of pain suggestive of the passage of gall-stones, though none were discovered in the evacuations by the medical officer who was first concerned with the case or by myself.

These paroxysms were, it appears, also a very prominent feature in the case recorded by Dr. Watson. "For eight or ten years (he observes), at intervals varying from ten to fourteen months, he (the patient) suffered a series of attacks precisely resembling such as are commonly produced by the passage of a biliary concretion through the excretory ducts of the liver. In May 1847, just after one of these attacks, while searching for a gall-stone, he discovered among the excretions from the bowels two or three small hydatids." The question therefore arises—is the occurrence of these writhing pains at intervals to be considered a symptom always common to the passage of gall-stones and the presence of hydatids in the liver; are we in practice, when such pains are complained of, to look to one or other of these causes for explanation; and if no gall-stones be found in the dejections, is it safe to assert the presence of hydatids? Such a conclusion would indeed add little to the comfort of the patient, but if justified by the result would undoubtedly increase the reputation of his physician. It remains only to add that in this case, as in that published by Dr. Watson, the urine was high-coloured, very scanty, and sometimes voided with a severe scalding sensation amounting to strangury; it is also desirable to state that the patient had not been at any former period affected with tape-worm.

No. 5.

Case of Anæsthetic Leprosy, with post-mortem examination and remarks.—By H. V. Carter, M.D.

Presented February, 1862.

A Mussulman, *ætat* 30, native of Dacca, but resident in Bombay, was admitted into the J. J. Hospital 8th December 1861, having for seven months (?) been affected with leprosy; is emaciated and weak. There is no abnormal appearance about the head beyond slight sinking of the nose; no anæsthesia in any part; the trunk also is free from disease. Both hands are affected; the fingers atrophied and superficially ulcerated; and there is complete anæsthesia extending some distance up the fore-arm. The feet and legs are similarly affected, and the great toe of the right foot is lost. Here the disease began, attacking the hands afterwards, and quite recently the face. Urine copious, pale; specific gravity 1003; free from albumen, slightly alkaline. The patient died of dysentery on January 7th.

Post-mortem examination.—No disease of the brain or spinal cord; the arachnoid of the latter, however, was studded with small ossific points, some placed near the posterior roots of the spinal nerves, but not calculated to affect them; this appearance may be regarded as a mere coincidence, and has not been again seen. No disease of the thoracic viscera; in the abdomen the kidneys were found small and mottled; sympathetic system normal; several Pacinian corpuscles of considerable size were seen at the root of the mesentery. The dysenteric appearances need not be here described, as there was nothing peculiar in them.

Upper extremity.—The nerves supplying the benumbed parts were diseased, viz. the lower part of the radial, the median above the wrist, and the ulnar at the elbow.

Lower extremity.—The external popliteal and its two main divisions, the external saphenous, the posterior tibial below, and to a less extent the internal saphenous, &c. were all diseased.

These nerves were enlarged, cord-like, firm, of a brownish semi-transparent hue, or mottled; the terminal branches were generally much atrophied. Measurements were taken and compared with those of corresponding healthy nerves. Further examination showed that the neurilemma was unaffected; the funiculi or nerve-cords were themselves the seat of these changes, which are owing to the deposit of a nucle-

ated fibrinous or albuminous material between the individual nerve-tubules, compressing and destroying them: this new formation has striking and peculiar characters, which however are not quite the same in recent and in chronic cases. A similar material has been found in the parts affected with tubercular leprosy.

Remarks.—This case completely demonstrates that the anæsthesia—the characteristic feature of all varieties of leprosy—is owing to a diseased condition which is confined to the nerves supplying the benumbed parts. The nerve-centres are not necessarily affected. These conclusions have been abundantly confirmed by the examination and dissection of six other cases of Leprosy, mostly of the anæsthetic form. The enlargement of the Pacinian corpuseles above referred to has never before been noticed, but it is by no means uncommon, being only a part of the general affection of the nervous system ; a dissected hand, with notes, was laid before the Medical and Physical Society in September 1860, and the preparation, showing very numerous large Pacinian corpuseles, is now in the Pathological Museum of the Medical College. The preceding case, with full description and illustrations was also presented to the Society more recently, and it is believed that the minute morbid anatomy of Leprosy was then described for the first time, as the only other observers (Messrs. Danielssen and Boeck, in Norway) who have given any details concerning this subject, do not seem to have made use of the miseroscope. When the whole subject of leprosy shall be more fully inquired into than is yet possible, these changes and others equally characteristic affecting the bones, &c. will be described in detail ; already it appears that leprosy in India differs in many respects from the same disease in Europe, and also from various syphilitic affections with which it may be compared. The principal data upon which my investigations have been founded are derived from the patients in the Dhurmsala, in Bombay, where nearly 100 lepers are resident, and also from the patients of the J. J. Hospital and Male Dispensary ; information is yet much needed on the premonitory symptoms and early stages of the disease, which those favourably placed might perhaps be induced to furnish, so that this wide-spread and fearful malady shall no longer remain an ignored subject. Its pathological interest is considerable, as it is probably the only disease known which is confined (if we may except the renal organs) to the nerves and the sentient skin ; and physiologically it claims attention as illustrating, often very forcibly, the effects of suspended nervous influence upon the tissues, such as are witnessed in the distortion and destruction of the extremities which render lepers such pitiable objects.

No. 6.

Note on Distoma hepaticum.—By H. V. Carter, M.D.

Presented August, 1861.

On account of the great rarity of this species of Entozoon in the human subject, it may be worth while to briefly notice the following instance of its occurrence. Last July four specimens were brought to the College by Mr. Atmaram Pandoorung, which had just been ejected from the stomach of a patient of his. She was a young Hindoo in an advanced state of pregnancy; there were no accompanying symptoms, and on no other occasion, before or since, have other distomata been voided. On inquiring as to the nature of the diet and drink, nothing was elicited that could throw light on the subject, and no other member of the household was similarly effected; the interest of the case is therefore purely one of natural history.

It is stated that the entozoa were of a reddish colour, like raw meat, when first seen, and that they then exhibited active movements. All four were much alike, the average size $1\frac{1}{3}$ inch by $\frac{2}{3}$ inch, shape elongated and lanceolate at the anterior extremity, the opposite being somewhat rounded; flattened. Present colour reddish-yellow, or light-brown; surface minutely wrinkled, margins corrugated, thin and wavy; the mouth, placed on a small papilla measuring $\frac{1}{40}$ in. in diameter, surrounded by a sheath-like groove and looking forwards, is very minute, and slightly oval; about $\frac{1}{20}$ in. behind it is the sucker, the oval aperture of which measured $\frac{1}{25}$ in. and is surrounded by a slightly-raised lip; its depth is considerable. The genital pore is a very minute transverse slit-like aperture, containing a curved body (the intro-mittent organ), and is placed somewhat nearer the sucker than the mouth. A simple dissections by means of needles shows the ventral sucker to be of comparatively large size and almost bell-shaped, being at first globular and then quickly becoming more pointed at the cæcal extremity. Connected with the genital pore is a long delicate tube which leads to a convoluted expansion (oviduct?), and near this is a separate irregularly-shaped sac, which seems to communicate with the tube, and may perhaps be regarded as belonging to the male organs of the hemaphiodite creature. The mouth opens into a globular muscular phanyax, from which the alimentary canals pass off: the opening belonging to

the so-called water-vascular system was not seen. In the parenchyma of the body *ova* were readily found: one is figured above, its length was $\frac{1}{190}$ inch, at one end the outer, transparent, elastic, and delicate coat is wanting, and the nucleated yellowish yelk was perfectly visible within. I have appended two simple but tolerably accurate figures in illustration of the above remarks, and comparing these and others in my possession, with those of Dr. Budd, &c. some differences are to be noticed. Dr. S. Cobbold (Intellectual Observer, No. 2, p. 117) gives a plate copied from Blanchard, which shows a very different external form; and Owen's the same (Lectures on the Invertebrata, ed. 2nd, p. 80); Owen states that the anterior extremity is broader and rounder, the posterior attenuated, but the specimens in my possession present rather an opposite configuration. Dr. Cobbold states that the outer coat or chorion of the ovum is of a yellow brown colour, on the contrary I find it very delicate and transparent: his figure, too, of the hooklets which are imbeded in the skin by no means corresponds with what I observe. I find these little bodies have very much the shape of a lancet, convex from side to side and also in the antero-posterior direction, so that the dorsum is everywhere rounded; about half (the pointed end) is free, the rest is imbedded in the nucleated integument and terminated by a wavy basal line: the entire length is about $\frac{1}{400}$ in. average breadth $\frac{1}{1500}$: one edge appears thicker than the other. They are confined to the ventral surface; are obliquely placed, and very numerous. One cannot help being reminded by this singular apparatus of the hooklets found around the head of Cystoid and Cystic entozoa, nor can we doubt their office is the same, namely that of enabling the parasite to advance. The above-mentioned points of difference are worthy of notice, if others should hereafter be found, a question of the indentity of my specimens with *D. hepaticum* might be raised. I find, too, similar discrepancies, or nearly so, between the Indian distome and that described by authors in Europe, have been previously pointed by Medical Officers in this country; thus for instance, in an elaborate Topographic account of the district of Dacca by surgeon J. Taylor, a species of *Distoma*, which is very prevalent (more so than *Tænia* the native doctors say), and gives rise to several serious complaints, as epilepsy, colic, and dropsy, is referred to as differing from *D. hepaticum* in the more closely approximated position of the pores, the larger size and more obtuse shape of the anterior (?) extremity of the body, which latter is also thinner and firmer. The author proposes the name *Distoma Intestinale* for this entozoon, its habitat

being the small intestines; but this circumstance is of too slight importance to furnish a specific character: the features previously noticed, however, confirm the impression that our species is not identical with the common liver fluke of Europe. *Vide* Plate 3, fig. 5.

The following additional remarks may be interesting: as to mode of propagation, the ova give birth to ciliated animals (like infusoria) in which is developed a cyst; these cysts are called sporo-cysts or nurses, and in them are formed the young distomata or cercaria; these latter are furnished with a tail and sometimes resemble in form, &c. a tadpole. The sporo-cysts are parasitic; the cercaria are generally free, and though commonly swallowed by molluses (fresh-water snails, &c.) do not develope themselves in their interior, but become encysted and afterward pass with the mollusc into the body of some vertebrate animal, where they lose the tail and acquire a generative aparatus and so becoming distomas, produce other ova, which being expelled pass through the same metamorphoses. The cercaria of distoma hepaticum is probably introduced into the body in the water drunk; various mammalia are infested, chiefly ruminants, and most frequently the sheep. *(Zoologie Medicale, Vol. II, by Gendrin and Van Beneden.)*

A list of other animals which are the occasional seat of this entozoon is given by Dr. Cobbold (*loc. cit.*); as regards man himself, see Budd on the Liver, ed. 2: Dr. Cobbold also refers to cases where the parasite was found elsewhere than in the liver, for instance, in the sole of the foot, and beneath the scalp; with reference to these latter cases, he says "there is every reason to believe that all these entozoa are referable to the species under consideration" (which he calls *Fasciola hepatica*, the 'old original' name): Owen however states that it is peculiar to the biliary ducts and gall-bladder, passing thence into the intestine, and Budd's statements are to the same effect.

In conclusion, there appears to be reason for regarding common salt as a preventative, when mixed with the food, at least sheep and cattle feeding in salt-water marshes are rarely affected with the *rot*, and salt is a useful remedy; the deficiency of it may have been the cause of the occurrence of Distoma in the case above related, and also of its prevalence at Dacca.

No. 7.

Notes on the Medical Topography of Sind, being portions of the Annual Medical Report on the Sind Division of the Army.—By Deputy Inspector General of Hospitals C. F. Collier, Esq.

Presented by the Principal Inspector General Medical Department.

Kurrachee.

Situated at the extreme north end of the Indian Ocean, the Gulf of Persia on its west, that of Cutch on the east, the Delta of the Indus in close proximity, the maritime cantonment of Kurrachee is destined ere long to become very important by its commerce, especially if its harbour is improved. It is less on that account, however, than that it is likely to form a large Military Station, that the present medical topography has been sketched. The railway will shortly facilitate the rapid movement of troops; the Indus affords a ready transport for stores and ammunitions, not only throughout Sind, but to the north-west and the Punjaub.

Kurrachee may be deemed a healthy station, but the province of Sind is decidedly very unhealthy. While pointing out the causes, I cannot enough dwell on the fact that by sanitary measures a locality may be rendered comparatively healthy even in unhealthy districts. The average temperature of Sind is higher than any part of India, and there are no periodical rains to mitigate it. It has but two seasons, the hot and cold, and these rapidly merge in each other, lasting respectively six months. The long-continued heat is not only a direct source of disease, but by producing debility renders individuals very susceptible to the annual fevers which follow the hot season upon the fall of the Indus. Swelled by the melting snows of the Afghanistan mountains and its tributaries from the Punjaub, &c. the river overflows a vast tract of country on each side. Subsiding in September it leaves to the soil all the conditions essential for the rapid evolution of malaria, and fevers with their sequels ensue. From November to April the climate is far more healthy. There are diseases resulting from long intense heat, less prevalent indeed than fevers, but far more formidable The march of Europeans during the heat of May and June in Sind, and away from the revigorating sea breeze, is simply murderous. They die of insolation, congestion of the brain, or of a remittent fever, ending in apoplexy or assuming a typhoid malignant type, even if marching at a

later period; whilst immediately preceding the season of fevers, the men's constitution, are badly prepared to resist malaria. It is clear that whatever may be done to diminish the danger and prevalence of disease yet the causes originating in extreme heat and inundations cannot be removed, and hence sanitary cares cannot be relaxed for a moment. Under such circumstances a locality must be sought for troops where the fierce heat is tempered by a sea breeze, and where the soil is most free from malaria. Unfortunately the sea-board of Sind is of no great extent.

Kurrachee fulfils the first condition, and may be made to accomplish the other. It should be, as it is, the Head Quarters of the Force, and if it be deemed essential to locate European Troops at Hydrabad, or other stations, they should be limited in number, frequently relieved, whilst their quarters claim the incessant vigilance of Military and Medical Officers.

The military cantonment of Kurrachee is on a gently sloping plain, surrounded like an amphitheatre on the north by hills of considerable elevation, which dwindle into mere hilly ridges towards the east, terminating in the rocky range called Clifton. The site of Kurrachee faces the sea and harbour on the south.

Of the geological formation of the mountains and ridges around, it need only be said that they are composed of coraline, nummulitic, and fossil shell, bearing lime, resting in some places on sandstone. The detritus of these rocks, their decomposition into pebbles, gravel, sand, and clay, form the soil of the plain. Such a soil is favourable to the absorption of surface water, while the gentle slope of the plain towards the sea speedily turns into the latter any sudden accumulation from the rains.

Wells dug in such geological strata will contain only brackish water, holding lime in solution, and having a purgative quality. It is certain that wells containing tolerable water are all dug in the proximity of the river Siaree, which rises in the hills of the north, passes by the Government garden, the jail, town, and empties itself in the harbour. The Siaree is a considerable stream during heavy rains, but is dry by far the greatest portion of the year, still water percolates beneath its bed, and may be reached a few feet below the surface. The boring for Artesian wells would meet with but doubtful success, and has been very partially tried. Three plans have been suggested:—one, to make a navigable canal to Jerruck, which would bring the water of the Indus to Kurrachee, and

promote commercial enterprize ; another is, to obtain the water from the Mullear river north of the cantonment, and at an elevation of some 150 feet from the foot of the church ; and finally, the one suggested by Colonel Turner, which would secure an unlimited supply of very pure fluid from the Hubb river. Among the hills, some six miles north of Kurrathee at Muggurpeer, are hot springs said to be salutary in certain diseases, and in one of which the water reaches a temperature of 120°.

The collection of these springs form a tank, the domicile of many alligators, fed by the voluntary contribution of goats. It is one of the rights of the neighbourhood, and curiosity is indulged at the expense of sundry limbs torn from poor men by the rapacious brutes, as the records of the Civil Hospital will show.

To the favourable description of the site of the Kurrachee cantonment there is a drawback. Between it and the sea there is an extensive swamp, some five or six square miles in extent ; the tides come over this within less than a mile from Camp, and at each ebb leave an accumulation of animal and vegetable remains to decompose beneath the rays of the sun ; some water courses loaded with filth empty themselves in it, and its oozy mud is at times fœtid in the extreme. The entrance of the sea into this swamp is by a creek between Clifton and the harbour, of no great depth or breadth, and it would be well to ascertain the best means (if practicable) to fill up or dry this unhealthy marsh. The property of trees to decompose mephitic exhalations might in the meanwhile be made useful. A belt of trees on the camp side of the swamp might correct in a degree its baneful influence.

The cold season comprises a period from the end of October to the middle of March, with an average minimum temperature of 61° and maximum of 72°. The hot season shows an average minimum of 80° and maximum of 88°. The heat is much mitigated by the clouded sky and south west breeze which usher the Indian monsoon, although without periodical rains heavy showers not unfrequently fall at Kurrachee about that period. The hygrometer betrays great humidity of the atmosphere which, in the months of September and October, shows itself in morning fogs and night dews, November being the driest month of the year. The temperate and cold seasons ensue, which are chiefly remarkable for occasional dust storms ; and, in January, for heavy showers.

This general description of meteorological changes must not be taken as a constant rule for Kurrachee, or as one applicable 20 miles inland

from the sea coast. The climate of this locality is extremely changeable. During the prevalence of a land wind the dew drop on the hygrometer can scarcely be obtained, and this is accounted for by the saline nature of the soil which rapidly absorbs humidity. A sea breeze arises and saturates the atmosphere rapidly.

The sudden changes of the thermometer are at times very singular, and the rise and fall of the barometer equally so. The maximum pressure on the latter is 30·138 in December, and 29·602 in July. A long observation induces me to think the climate liable to rapid changes of temperature from a turbulent atmosphere, depending on the peculiar locality of Kurrachee and geographical surroundings.

Medical men will readily understand what influence such a climate may have in originating disease, and also on the progress of maladies it did not cause. The functions of the skin are liable to be suddenly checked while perspiration is profuse, and congestion follows in predisposed organs. Hence diarrhœa, dysentery, catarrh, &c. which somewhat prevail. The cure of rheumatism from the same cause is greatly protracted or fails, and as a sequence valvular disease of the heart is induced. Phthisis, too, is not unfrequent, and becomes rapidly fatal.

I dwell on these results of climate to urge the best means of obviating them. Substantial, lofty, and well-ventilated barracks will secure a pure atmosphere and more equal temperature ; the drainage and cleanliness of camp its salubrity. On these latter conditions every facility and assistance have, to the honour of the military authorities, been given in cantonment ; but in the town and harbour there is much to improve.

Epidemic cholera during the hot weather was of frequent occurrence at Kurrachee long before, and in the early years, of our conquest. In 1846 its visitation in Her Majesty's 86th Regiment was very disastrous ; it was preceded by a dust-storm blowing from the town, and observed by many as extremely fœtid. Cholera appeared a few months ago epidemical in the surrounding villages and the town, but only sporadic cases occurred in the cantonment, and it was remarkable of these cases that the individuals (Europeans) came mostly from the harbour. Every precaution was taken in camp, but the municipal regulations were but little enforced, or scavengers encouraged, and at the very time putrid fish and meat were sold in the bazars, circumstances which I brought to the notice of the Civil authorities. As a fact, however, it may be taken that cholera is of rare occurrence at Kurrachee.

During the hot season there are occasional cases of insolation, of apoplexy, of congestion of the brain, and the fevers at that time are remarkable for cerebral and hepatic complications.

The subsidence of the Indus, the drying up of swamps, and decomposition of vast accumulations of vegetable matter in the end of September, although occurring at a distance from Kurrachee, have a remote influence on health there, and bring on intermittent and remittent fevers, and their sequels of enlarged spleens, morbid hepatic functions, and relapses, inducing permanent debility.

The cold weather supervenes the hot almost suddenly, and those exhausted by fever become liable to diarrhœa, dysentery, and other diseases of the mucous membranes, as catarrh, &c., &c. But I have observed a form of subacute bronchitis among sepoys who have long suffered from fever, which is very suddenly and frequently fatal among them. Rheumatism is also prevalent at this time. To the mass, however, the cold season proves reinvigorating, and secures to many immunity from disease; but my remarks have been of little value, if they have not pointed out the urgency of judicious clothing for the troops in so variable a climate.

Hydrabad.

The distance of Hydrabad from the sea, its immediate proximity to the Indus, must subject it to a greater and more prolonged heat, and also to the endemic fever usual on the fall of the great river. I was stationed in the entrenched camp on the river shore in 1844 and 1845, and in my regiment officers and men were prostrate with fever during the autumnal months of each year. The large force in the cantonment around suffered also very severely, though, as compared to the proportion of sick, there were but few deaths. Both years had been remarkable for heavy falls of rain, and to such falls have been traced an increase of sickness in the province. The intermittent and remittent fevers of Sind rarely run into the typhoid type, or are so severe as in Gujarat. Prevailing strong winds, sand-storms, and other atmospherical changes, probably tend to dilute miasma and reduce its baneful effects on man. Again, it must be considered that the two years to which I allude above, were those of the conquest of the country, and that many unavoidable circumstances tended to deteriorate the atmosphere. Since then some seasons have been worse than others, yet the climate of Hydrabad cannot, in my humble opinion, be deemed an irreclaimable one.

It is a most pernicious, no less than an unfounded but prevailing notion, that because a district is unhealthy we may not render a loeality in it better. Much remains to be known of the laws of a mephitie atmosphere, but this at least is eertain, that in this country its deleterious effeets do not extend much beyond 800 feet in eireumferenee from its souree. The reasonable deductions is, therefore, that a loeality may in a great measure be saved from deleterious exhalations. It has also been well observed that the intensity of miasma from any swamp is in proportion to the speed with which foul water dries; *2nd*, to the want of free ventilation to disperse it; *3rd*, to the concentration it aequires from a cheek to the ventilation; and *4th*, to the want of large trees to deeompose it. If these results of experienee are well borne in mind means may be taken to modify the effects of malaria, surface water must be allowed no where to aecumulate. If tanks are essential they must be deepened that they may subside slowly, wells must be frequently drawn, and a parapet to prevent dirt, leaves, or any other souree of animal or vegetable decay to aecumulate in them. Large trees deeompose mephitic gases effeetually. The latter are seen to stick to them like shrouds, and gradually disappear, and they should be eneouraged between Hydrabad and the Indus, but the lower branches intercept the eireulation of air: what so reasonable as to lop them off? It is the lower shrubs and rank vegetation which rapidly decay. It is these whieh must be constantly removed where they appear. But Hydrabad and its cantonment are principally built on a low range of table-lands of lime, which appear as if they had been upheaved from the alluvium of the Indus. There, when the wind blows from the direction of the river, mephitie vapours aceumulate at their base. In such situations I have known regiments decimated, while in faneied security from the malaria of the lower marshes. The baneful exhalations checked but to concentrate, soon prove their existence by spreading disease where it was imagined the height of the table-land eonferred immunity; every means in such a case must be tried to create draughts of air, to burn fires at the base of the hills, and above all to prevent dwellings being built on the verge of the table-lands, immediately over the direction of the river.

In the fort of Hydrabad, in the town, in the cantonments, cleanliness, the removal of surfaee water by drains (so easy from their raised position), wide streets, should be obtained at any priee; and to insure free ventilation the peremptory removal of dirty huts, of crumbling walls, of ruined little inelosures, all mere reeeptaeles of filth, should be insisted on.

In fact, stringent sanitary regulations to insure the welfare of the many, all this may be obtained by energy on the part of the authorities concerned. In the lower plains at the base, there are great but not insurmountable difficulties. Here and there a little morass resulting from rain, or the overflowing of the Fullallee. The very slight inclination of the plain towards the Indus is indeed a great obstacle, but from all I have observed not such as our intelligent engineers cannot remove. I have no doubt that by proper measures Hydrabad and its cantonment may be made comparatively healthy, but the care must be unrestricted and unremitted.

In the hot season there are results from exposure to the sun which must be guarded against. The long exposure of European, or even native soldiers, to a brass sky, and vertical rays of the sun, cannot be met with impunity

A frightful mortality among the soldiers of Her Majesty's 86th Regiment took place at Hydrabad from insolation. An illustrious and in every respect a well-intentioned General, Sir Charles Napier, sent for me and attributed the death of many soldiers to bad treatment in hospital. An explanation proved to him that it was the result of exposure to the sun of a guard of honour intended for the reception of the Chiefs in Sind. Immediate were the orders, and immediate was the stop of the calamity. The men were struck down as if by a sledge hammer. The pouring of cold water on their heads by a Bheestie from a mussuck, seemed the only cause of recovery in the few that were restored to life. Need I say that Commanding Officers cannot be too careful in exposing troops to the deadly influence of the sun in the hot season.

Heavy dews prevail, and are very pernicious to persons sleeping exposed to them. I have seen the sheets of a bed placed unscreened on a high terrace completely saturated by the dew, and careless as the soldier is in general of such matters, it behoves Medical officers to point out the risk and its prevention.

I have seen certain affections of the bronchia which appeared to me distinctly traceable to inhaling the impalpable dust of continual dust-storms. Many individuals have a chronic state of irritation of the mucous membranes lining the air tubes, and to such an atmosphere loaded with fine sand must prove injurious; observations are much needed on this subject, and I believe if the attention of Medical officers was called to it the result might prove interesting.

One last point I would notice respecting the evil of too long a residence at Hydrabad by European soldiers; some may escape fevers

or active diseases, but none will risk with impunity the prolonged high temperature of the climate : a premature debility of the system is sure to result. With greater means a Civil or Military officer may struggle by artificial appliances against it more or less, but the soldier has no such resources, and European corps should be frequently relieved.

Sukkur.

A portion of the Halla range is prolonged to this place, rising abruptly from the alluvium on the west side of the Indus, dividing the river in two streams by a line of rocks, the largest of which forms the fort of Bukkur, and then extends to the town of Raree upon the eastern bank. The navigable channel is between Bukkur and Roree, that between Sukkur and the fort is very narrow, the current rapid, and, I believe, rarely used. The late Sir Charles Napier considered Sukkur a most important locality as a point of strategy. If possibly some political contingency may compel its re-occupation by British troops, it may not be irrelevant that I should give some details of its sanitary condition. As a permanent residence for soldiers former arrangements were very ill calculated, and this is the more singular that Sukkur appears to offer considerable advantages for the improvement of its unhealthy climate. The fearful results of disease among Her Majesty's 78th Highlanders in 1845 gave Sukkur a very bad reputation, but I think it is merely subject to the usual fevers and the trying hot seasons experienced at the other stations of Sind. The 78th regiment had been marched from Kurrachee to Sukkur at an unfavourable season, and arrived predisposed to the attacks of the October fevers. Their barracks were low and confined, and void of every appurtenance of comfort or ventilation. They had been built, it was said, upon old cemeteries, which had been used for generations by the inhabitants of Sukkur to bury their dead. The walls were of sun-dried bricks, and the mud for the building taken from the spot. Certainly such a site, and such materials used for barracks, might account for any amount of pestilence. Even if this last circumstance be an exaggeration, there remains quite enough mismanagement in the construction of the barracks and their appliances to explain the mortality of the unfortunate soldiers from malignant fevers which such a state of things was likely to foster. From the number of Officers who, being better lodged, and having better means of reducing temperature and ventilation, not one died, and very few were sick at all. This would appear very conclusive.

I have already pointed out in this report the means of checking miasma, and moderating the evil results of climate. These will not be obtained without expense, but the argument resolves itself to this, that if Sukkur, as indeed all Sind, is to be occupied by European troops too many precautions cannot be taken to preserve their healths. In the cantonment of Sukkur, the drainage is almost natural from the hills in the river. The superficial soil of the site of new barracks should be removed to the rock, and the buildings should be of stone or terraces, high, broad, well ventilated, and with wide verandahs to mitigate the heat and glaring light, &c., &c., &c.

Shikarpoor.

This cantonment is now almost deserted. There are but few European inhabitants, consisting of the Assistant Judge, Medical Officer, Engineer, and Lieutenant of Police.

Jacobabad.

This station once called Khanghur, a desolate desert with three wells of salt water as the only salient points, and with scarcely a vestige of vegetation, is now a fine cantonment for four regiments of cavalry, two of infantry, and a mountain train. A fine canal brings water to this once sterile locality, and in the wells which have been dug the water has risen lately some two feet from its former level. Umbrageous trees have sprung up; fine houses have been built; wide bazars and good lines and hospital, &c. for the troops. The advent of this military colony, the excellent regulations adopted for its police and sanitary condition, have drawn a large increase of population, and I understand that agriculture is flourishing around. The whole locality is very clean; the buildings reared of dried mudbricks, with terraced roofs, are in good repair; and will remain so while carefully looked after, but once abandoned such buildings have no permanancy.

The great drawback of Jacobabad is its climate, which is very trying. In the north-west a high range of hills surrounds it like a distant amphitheatre. On these hills (the Murree) I saw snow at the period of my inspection (in January), and the wind blowing from that quarter was very cold, but again such a position must in the hot season make the temperature very exhausting.

The mountain range must check the wind from the only quarter where it could be cool, and the tornados of dust and hot blasts from the alluvial plains of the south-east must be felt to be understood The

truth is that the extremes of temperature are unhealthy. In the sickly season the malaria of the Indus is blown in the direction of this cantonment, and the proportion of admissions for fever is very large at the time, but one fact I must note, the number of deaths is much smaller, and the typhoid type of fevers more rare. Under the best view we can take of it, the climate is very exhausting, and induces a premature constitutional debility after a long residence.

I trust these rough general observations on the climates of military stations, the result of a long residence in Sind, will not be deemed tedious. I have sought to make them as short as I could consistently with their importance.

No. 8.

Case of Compression of the Brain. Communicated by Assistant Surgeon C. Joynt, M.D.

Presented by the Principal Inspector General.

A healthy recruit, of the 2nd Regiment Light Cavalry, age about 21 years, was admitted into the Hospital at Rajcote at ½ past 7 on the morning of the 8th January 1861, having been thrown from his horse whilst upon parade about half an hour before. The scalp on the left side of the occipital protuberance was contused, and cut in two places, but neither fracture nor depression could be detected. Symptoms of concussion were present, and he appeared in a state of great depression. When roused, he was capable of answering questions only to a very slight extent, and manifested considerable irritation when he was interfered with. He could not swallow. At 9 A.M. he was more insensible; pulse very weak. No reaction. At 11 A.M. the pupils were dilated and insensible to light; pulse still feeble, breathing stertorous and coma profound. In consultation with Dr. Pirie, the seat of injury was carefully examined, but neither fissure nor depression of bone could be found; the incisions made into the scalp bled freely: a strong purgative enema was administered. He was cupped to 9 oz. at the back of neck, and a blister applied. At ½ past 4 P.M. reaction was apparently setting in, pulse had become distinct, the surface warm, but there was stertor; no action from the enema, which was repeated, and immediately afterwards, whilst being raised to have the blister dressed, the stertor ceased, the breathing suddenly became quicker, and then ceased altogether.

Post-mortem appearances 14 *hours after death.*—Rigor mortis well marked. Body well formed and muscular. On dissecting off the scalp it was found much contused for a space about as large as a crown piece a little to left of occipital protuberance. The pericranium was not denuded. A thin layer of fat existed beneath the scalp. On removing the calvarium, which was carefully done with a saw, not the smallest trace of injury to the cranium was found. The dura-mater was also uninjured, but bulged out, and was dark-coloured. On incising it, large coagula existed over the whole surface of the cerebrum, but slightly on left side. The right anterior lobe of the cerebrum was extensively lacerated and its structure broken down. The cerebral surface was elsewhere uninjured, the cerebral lesion having occurred precisely opposite the seat of injury.

No. 9.

Deaths reported to have occurred from the bites of Scorpions.

In the diaries of the Superintendent of Police, Rutnagherry, three deaths were reported to have taken place from the effect of Scorpion bites.

1. 20*th May* 1861. In Kelondey, Talooka Unjunwell, it was reported that a Maratha male, age about 30 years, was stung on the foot by a Scorpion, became insensible, and died within an hour of infliction of the bite.

2. 15*th June* 1861. In Boregaum, Talooka Unjunwell, Gunno, a Coonbee Boy, 15 years old, was bitten on the right foot by a scorpion whilst ploughing; he was affected with great difficulty of breathing, and died within two hours.

3. 13*th July* 1861. In Doughler, Talooka Sevendroog, a Maratha man, 25 years old, and after becoming insensible died in an hour and a half.

No treatment was adopted in either case, but on each instance the Scorpion was killed.

ABSTRACT PROCEEDINGS

OF THE

MEETINGS OF THE MEDICAL AND PHYSICAL SOCIETY,

FOR THE YEAR 1861.

No. 1.

MONTHLY MEETING HELD 2ND FEBRUARY 1861.

Present :

H. J. Carter, Esq., F.R.S., *Vice-President*, in the Chair.

Members.—T. B. Johnstone, M.D. ; C. C. Mead, Esq. ; R. Haines, M.B. ; G. C. M. Birdwood, M.D. ; and W. C. Coles, M.D., *Secretary.*

The proceedings of the last meeting, held on the 1st December 1860, were read and confirmed.

A letter was read from Assistant Surgeon W. A. Shepherd, applying to become a member of the Society under Regulation V., agreeably to which he was declared to be admitted. From Assistant Surgeon H. R. McDougall, requesting to be allowed to withdraw from the Society. From the Superintendent Government Observatory, forwarding the "Meteorological Observations for 1859."

The first paper brought before the meeting was the "Annual Report of the Mount Aboo Sanitarium, ending 31st December 1860," by Assistant Surgeon Moore, M.D.

A report of a case of *Hydrophobia*, with a novel method of treatment by Dr. Moore, was then read (see Vol. VI. p. xxx. Appendix).

Notes of a few Medical and Surgical cases by Assistant Surgeon J. M. Barnett, whilst on field service, Kattywar, were then communicated.

Dr. Birdwood showed a specimen of *Gentian*, forwarded by Dr. Broughton from Mahableshwar, which was considered undescribed until the appearance of Dr. Gibson's and Mr. Dalzell's work on Botany, published a few days since, and named by the latter "*Ophilia Multiflora*" (see Vol. VI. p. lviii. Appendix).

After the best thanks of the Society and been accorded to the contributors of Papers, the meeting was adjourned to Saturday the 2nd March.

No. 2.

MONTHLY MEETING HELD 2ND MARCH 1861.

Present :

A. H. Leith, M.D., *President*, in the Chair.

J. Peet, M.D., F.R.C.P., *Vice-President*.

Members.—W. Arbuckle, M.D.; H. D. Glasse, Esq.; C. C. Mead, Esq.; G. C. M. Birdwood, M.D.; G. C. Bell, M.D.; and W. C. Coles, M.D., *Secretary*.

The proceedings of the last meeting held on the 2nd February 1861 were read and confirmed.

A letter was read from Dr. Waring, Trevandrum, intimating the despatch of several publications as presents to the Society, which have not however yet come to hand.

The third Number of the "Madras Quarterly Journal," four numbers of the "British Medical Journal," and two copies of the "Indian Lancet" were laid on the table, having been received since the last meeting.

A letter was read from J. St. C. Wooltorton, Esq., President of the Managing Committee of the Byculla Library, applying for copies of the Transactions (New Series). The request was referred to the Committee for disposal.

Dr. Birdwood read a highly valuable and interesting paper "on the introduction of the Cinchona plant into India," presented by Clement R. Markham, Esq., F.R.G.S.* In this paper an account is given of the nature of those forests in South America, of which the Cinchona trees are natives, and the conclusions at which Mr. Markham has arrived, after examining some of the hill districts of the India Peninsula, regarding the localities which are likely to be most suitable for the culture of plants in this country. Details are entered into respecting

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* See p. 333, vol. 6, new series.

the causes which have made this measure so important, a review is taken of former attempts to introduce the Cinchona, and the measures adopted by Mr. Markham for the conduct of this important experiment described with the present prospect of final success.

The Secretary then read some extracts from reports on the use of large doses of arsenic in the treatment of uncomplicated intermittent fever, which will, with other reports, now due, be hereafter analysed and arranged.

After the best thanks of the meeting had been voted to Mr. Markham, for kindly forwarding his paper to the Society, the President announced that the usual recess of three months was about to take place, and that the next meeting would be held on Saturday, 6th July 1861.

No. 3.

MONTHLY MEETING HELD 6TH JULY 1861.

Present :

A. H. Leith, M.D., *President,* in the Chair.

H. J. Carter, Esq., F.R.S., and J. Peet, M.D., F.R.C.P., *Vice-Presidents.*

Members.—W. Campbell, M.D.; W. G. Hunter, Esq.; G. C. M. Birdwood, M.D.; H. V. Carter, M.D.; and W. C. Coles, M.D., *Secretary.*

The proceedings of the last meeting, held on the 2nd March, were read and confirmed.

Letters were read from the Librarians of the undermentioned Institutions, acknowledging the receipt of the 5th Volume of the Transactions for 1859: the "University of Aberdeen;" "King's College, London;" "London Hospital;" "Royal Medical and Chirurgical Society, London;" "Trinity College, Dublin;" "Royal Society, London." From the President Managing Committee of the Byculla Library, acknowledging the receipt of a set of the Transactions. From the Principal, Grant Medical College, acknowledging having received the 6th Volume of the Transactions, viz. that for the year 1860.

A letter was read from E. Impey, Esq., dated 6th March, requesting, on account of his continued and prolonged absence from Bombay, to be allowed to withdraw from the Society.

The presents laid upon the Table were the several numbers of the "Indian Lancet," the "London Medical Journal," and the "Dublin

Quarterly Journal" received since the last meeting. From Dr. Waring, Trevandrum, a work on the use of indigenous or bazar medicines as substitutes for articles of the Materia Medica derived from Europe, and a pamphlet on "Indigenous Anthelmentics." From the Principal Inspector General, Medical Department, Report on Vaccination for 1858 and 1859. A Report on the extent and nature of the sanitary establishments for European troops, in the Bengal, Madras, and Bombay Presidencies. Publications of the General Board of Health, London, and a list of the Fellows, Members, Licentiates, and Extra Licentiates of the Royal College of Physicians, London.

The Secretary stated that the 6th Volume of the Transactions was issued on the 1st June, and that copies had been furnished to all subscribers in this country. About 75 presentation copies had been forwarded to England, to be distributed to retired Members—Honorary Members—and to the numerous Societies and Institutions in Great Britain; and that a complete set of both the old and new series had been presented to the Army Medical School, Chatham.

A paper, presented by the Principal Inspector General Medical Department, entitled "Special considerations on the health of European Troops," by Dr. Grierson, M.D., Staff Surgeon, Kurrachee, was then read (see p. 1 ante).

An interesting case was then read, forwarded by Assistant Surgeon Joynt, Scinde Horse, of the death of a recruit of the 2nd Cavalry following a blow on the head in which no external injury could be perceived, or fracture detected, but in which after death laceration of the brain was discovered (see p. xlii. ante).

After the best thanks of the meeting had been accorded to the contributors, it was adjourned to Saturday, 3rd August 1861.

No. 4.

MONTHLY MEETING HELD 3RD AUGUST 1861.

Present:

A. H. Leith, M.D., *President*, in the Chair.

H. J. Carter, Esq., F.R.S., and J. Peet, M.D., F.R.C.P., *Vice-Presidents.*

Members.—W. Arbuckle, M.D.; W. Campbell, M.D.; T. Crawford, M.D., 18th Royal Irish Regiment; R. Haines, M.B.; G. R. Ballingall, M.D.; J. Welsh, Esq.; T. Diver, M.D.; Ponsomby Adair, Esq.; and W. C. Coles, M.D., *Secretary.*

The proceedings of the last meeting, held on the 6th July, were read and confirmed. Letters were read from the Registrar of the Royal College of Physicians, London, acknowledging the receipt of the 5th Volume of the Transactions of the Society. From the Secretary to the Bombay Mechanics' Institution; from the Principal Grant Medical College; from Assistant Surgeons J. M. Barnett, and H. C. Kingstone, M.D.

The presents laid upon the table were four numbers of the "British Medical Journal" received since last meeting, one number of the "Chemist and Druggist," "the Annual Report of the Grant Medical College," "Transactions of the Epidemiological Society of London," Vol. I. Part I., and the July No. of the "Madras Quarterly Journal of Medical Science."

Assistant Surgeon Kingstone was duly proposed and elected a Member of the Society under Regulation No. 5. Assistant Surgeons P. S. Turnbull, M. D., and H. A. Lewis, were elected Members for two years, on admission into the service under Regulation No. 6.

The first paper presented to the notice of the meeting was the Annual Report of the Sanitarium, Poorundhur, ending December 1860 (see p. 45 ante), by Assistant Surgeon W. A. Shepherd, in medical charge, and forwarded by the Principal Inspector General. This is a very elaborate and comprehensive Report, consisting 1st, of an Historical Sketch of Poorundhur; 2nd, a description of the present Hill Sanitarium, as respects barracks, accommodation, &c.; 3rd, on the climate and productions of Poorundhur; 4th, the medical history of the year 1860; and lastly, the changes which have taken place during the year, with observations thereon. From the report, it appears that since 1852, Poorundhur has been under six different Commandants, and nine Medical Officers. That from 1856 to the end of 1860, nearly 2,000 European soldiers have been treated on the Hill as patients, about 1,500 of whom were returned to duty as cured, 29 died, and about 330 sent way as cases unsuited to the climate. On the 1st January 1861 there were 97 convalescents at Poorundhur.

A paper by Dr. W. J. Moore, in medical charge of Mount Aboo, was then read, in which he treated separately, and fully, of three affections incident to tropical countries, viz. of a masked form of malarious fever; of congestion of the spleen; and of local cachexia. After fully discussing the question of *malaria*, the author gives a description of the symptoms of, and effects produced by, malarious fever in a masked form. To the statement, that the circulation was not excited in this

form of fever, some exception was taken by the meeting, as it was contended that there could be no fever without some such excitement. In the accurate and graphic description of the symptoms and effects of splenic engorgement and local cachexia, the meeting fully agreed, and felt indebted to Dr. Moore for bringing before them a paper possessing so much interest and originality (see p. 94 ante).

After some discussion on the several points noticed in the above paper, specimens of *Distoma hepaticum* from the human subject, and a beautiful drawing of the same by Dr. H. V. Carter, were placed on the table, and his notes thereon read.

The meeting separated after the usual vote of thanks to the contributors of papers, and was adjourned to Saturday, the 6th September 1861.

No. 5.

MONTHLY MEETING HELD 7TH SEPTEMBER 1861.

Present:

A. H. Leith, M.D., *President*, in the Chair.

H. J. Carter, Esq., F.R.S.; and J. Peet, M.D., F.R.C.P., *Vice-Presidents.*

Members.—W. Arbuckle, M.D.; W. Campbell, M.D.; T. B. Johnstone, M.D.; T. Diver, M.D.; R. Haines, M.D.; W. G. Hunter, Esq.; G. C. M. Birdwood, M.D.; Ponsomby Adair, Esq.; and W. C. Coles, M.D., *Secretary.*

The proceedings of the last meeting were read and confirmed. Letters were read from several members on the ordinary business of the Society, and acknowledging the receipt of the last volume of the Transactions.

Four numbers of the "British Medical Journal," and three numbers of the "Indian Lancet," received since the last meeting were laid upon the table.

The first paper presented to the notice of the meeting was the Annual Return and Report of the 1st Battalion 4th (King's Own) Regiment, by Surgeon Gorringe, presented by the Principal Inspector General (see p. 105 ante).

Portion of some general and medical notes on Larkhana, by Mr. Assistant Apothecary Vincent DeSouza, were then read, which being drawn up with great care, possess considerable interest, and are highly creditable to Mr. DeSouza's industry and ability.

Mr. Carter then brought forward an interesting and rare case of "Melanosis of the Eye," and exhibited a portion of the melanotic tumour which had been removed. This led to a discussion amongst the members as to the true nature of Melanosis, and in which it differed from the varieties of cancer.

Three instances of reputed deaths from scorpion bites in the Rutnagherry Zilla were then related to the meeting, having been kindly forwarded by the Revenue Commissioner, Southern Division, through Dr. Arbuckle. They are alleged to have occurred in May, June, and July last; two in the Unjenwel, and one in Sevendroog Talookas. One individual died, it is said, within an hour, another within one hour and a half, and the third lived two hours, after having been bitten by the common Scorpion, each in the foot, whilst the men were ploughing in the fields.

The President remarked that he knew of a well-authenticated case of death following upon a Scorpion bite.

An instance of death from "Snake bite" at the Gogo Dispensary, which occurred in June, was then read, as also an account of some wounds inflicted upon children by a dog supposed to be rabid, in which Mr. Anding, the Apothecary in charge, was making use of a supposed specific, or a prophylactic against hydrophobia.

After the best thanks of the meeting had been accorded to the contributors, it was adjourned to Saturday, 5th October 1861.

No. 6.

MONTHLY MEETING HELD 5TH OCTOBER 1861.

Present:

A. H. Leith, M.D., *President*, in the Chair.

H. J. Carter, Esq., F.R.S., and J. Peet, M.D., F.R.C.P., *Vice-Presidents.*

Members.—W. Arbuckle, M.D.; W. Camphell, M.D.; R. Haines, M.B.; J. Welsh, Esq.; T. Diver, M.D.; G. C. M. Birdwood, M.D.; G. C. Bell, M.D.; and W. C. Coles, M.D., *Secretary.*

The proceedings of the last meeting were read and confirmed. A letter from the Secretary to the Geographical Society, dated 23rd September, acknowledging the receipt of the last volume of the Transactions, was read, and four numbers of the "British Medical Journal" were laid upon the table, received since the last meeting.

The first paper read was on "Hyptalgia," or "Neuralgia" of the Liver, by Assistant Surgeon W. J. Moore, M.D., Aboo Sanitarium (see p. 84 ante).

The writer, after remarking upon the almost entire absence of any recorded opinions on the subject, and the silence of nearly all authors (with the exception of Dr. Copland) on Medicine or on Indian diseases regarding Neuralgia of the Liver, proceeds to consider the affection under the symptoms by which it is characterised, the diseases for which it may be mistaken, and those with which it may be associated, entering fully into a consideration of each with a view to a correct diagnosis. The causes of neuralgia or nervous pain in the liver, are then enumerated, and the appropriate treatment of the disease described.

Several points in the paper were the subject of discussion by the meeting, and the experience of most Members went to show that the solar plexies of nerves, and particularly the hepatic plexies, were sometimes affected with Neuralgia. The President remarked that he had observed aquatidian form of neuralgia of the liver, evidently due to malarious origin.

Tables of the Health Statistics of the European Troops at the different stations of the Bombay Army for ten years, presented by the Principal Inspector General Medical Department, where laid before the meeting, and examined by Members (see p. 251 ante).

Mr. Carter then read a note "On the possibility of the Guinea Worm entering the human body in an embryo state through one of the sudorific ducts," which will be published in detail in the next volume of the Transactions. Mr. Carter stated that he had lately discovered "*Filarida*" entering into a fungus (a species of "*Xylaria*") which grows on the decaying trunks of Tamarind trees, for the purpose of nutriment, through apertures not exceeding the $\frac{1}{1880}$ of an inch in diameter, and considered it a fair inference that the young of the Guinea Worm might enter the human body through the sudorific ducts, which are considerably larger than those just described, as he considers it almost fully established that the dracunculus cannot maintain an independent existence, but must be derived from some extraneous source. The specimens of "*Xylaria*" and drawings of the "*Filarida*" were placed on the table (see p. iii. Appendix ante).

A case of extensive sword cuts on a native female, by which the left arm and the right thumb were cut off, the scalp in several places laid bare, and the head almost severed from the neck, under the care of

Assistant Surgeon McDowall, was read. The patient slowly, but satisfactorily recovered, under the judicious treatment adopted.

An instance of the assumed good effect of Belladona in poisoning by opium, which occurred at the Bhooj Dispensary, was read.

The President placed upon the table an interesting pathological specimen of disease of the spleen, and showed a portion of a stomach, on the anterior surface of which a needle was adhering to the omentum. The needle, however, had given rise to no symptoms during life to indicate its presence.

After the best thanks of the meeting had been accorded to the contributors, it was adjourned to Saturday, the 2nd November 1861.

No. 7.

MONTHLY MEETING HELD 9TH NOVEMBER 1861.

Present :

A. H. Leith, M.D., *President,* in the Chair.

H. J. Carter Esq., F.R.S., *Vice-President.*

Members.—W. Arbuckle, M.D. ; W. Campbell, M.D. ; T. B. Johnstone, M.D. ; T. Diver M.D. ; C. C. Mead, Esq. ; R. Haines, M.D. ; G. R. Ballingall, M.D. ; J. Welsh Esq. ; G. C. M. Birdwood, M.D. ; H. V. Carter, M.D. ; and W. C. Coles, M.D., *Secretary.*

The proceedings of the last meeting were read and confirmed.

The presents to the Library were laid on the table, viz. : the last number of the "Indian Annals of Medicine ;" Number VI. of the "Madras Quarterly Journal ;" four numbers of the "British Medical Journal ;" and "Deaths in Madras during 1859."

A letter was read from Surgeon W. Hanbury, H. M.'s 33rd Foot, dated 7th October, which was directed to be acknowledged with thanks for the communication which accompanied it.

Dr. Haines read a paper "On the extraction and estimation of some of the Crystalline principles of Opium" (see p. 222 ante).

In this paper were detailed the proceedings which had been adopted to extract and prepare *Hydrochlorate of Morphia* from a large quantity (360 lbs.) of damaged opium, which had long been in the Medical Stores. The quantity of morphia salt obtained varied from a minimum of $4\frac{2}{3}$ to a maximum of $5\frac{3}{4}$ per cent. of the opium used. The method by which the other crystalline principles, viz. *Narcotine, Codeia, Thebáia,* or *Paramorphia, Narceine,* and *Meconia,* were subsequently extracted

from the residue, was described, and the specimens of these principles in a pure state, exhibited. The paper concluded with a summary of the various methods recommended at different times for the estimation of the proportion of morphia in opium, and a description was given of certain modifications and improvements which had been introduced by the author into the process of O'Shaughnessy,—a process by which the proportion of the *Narcotine*, as well as of the *Morphia*, are both shown. By the improved method, these principles were obtained at once in a crystalline form. The *Narcotine* in a state of perfect purity and whiteness, and the *Morphia*, but slightly-coloured specimens of the results of the method were shown.

A letter, addressed by Surgeon Major C. Morehead, M.D, to the Right Honorable the Secretary of State for India, dated 17th September, was read (see p. vii. Appendix ante).

The Secretary then read a case of "Hydatids of the Liver evacuated through the Lungs," by Surgeon W. Hanbury, which was considered almost unique, and worthy of publication in the next volume of the Transactions.

After the President had exhibited some interesting pathological specimens, the thanks of the meeting were given to the contributors of papers, and it was adjourned to Saturday, the 7th December 1861.

No. 8.

MONTHLY MEETING HELD 7TH DECEMBER 1861.

Present :

A. H. Leith, M.D., *President*, in the Chair.

H. J. Carter, Esq, F.R.S., and J. Peet, M.D., *Vice-Presidents*.

Members.—W. Campbell, M.D. ; T. Diver, M.D. ; R. Haines, M.D. ; J. Welsh, Esq. ; A. M. Rogers, M.D. ; G. C. M. Birdwood, M.D. ; H. V. Carter, M.D. ; and W. C. Coles, M.D., *Secretary*.

An abstract of the Proceedings of the last meeting having been read, the proceedings were confirmed.

The presents to the Library since the last meeting were four numbers of the "British Medical Journal," and the October number of the "Chemist and Druggist." From the Principal Inspector General of the Medical Department, "Deaths in Bombay during 1860," "Cholera in the Delhi Division," and "Dr. Husband's Treatise on preserving Vaccine Lymph."

Surgeon W. Hanbury, H. M.'s 33rd Foot, was duly elected a member of the Society under Regulation V., and Assistant Surgeon F.R.O. Kearny on entering the Bombay Medical Service and for a period of two years.

Dr. H. V. Carter read a paper entitled Pathological observations, No. V. He stated that the present communication is the second on a subject already brought before the Society, a year since; viz. the peculiar condition of the urinary excretion termed "Chylous;" the true pathology of which is yet obscure. On that occasion the view was proposed, and sustained by various cases from the Jamsetjee Jejeebhoy Hospital, and by inferences upon them, that the affection in question is owing to direct admixture of the two fluids,—chyle and urine. In these cases a dilated hypertrophied or varicose condition of the lymphatic system is present, followed probably by rupture of some of the smaller vessels, and free discharge of their contents on any mucous surface implicated, in this case, the urinary. Evidence of the actual occurrence of such a state of the lymphatic system was brought forward in drawings, and notes of cases; in one of the latter chylous urine coexisted with, and was connected with, the local affection.

Since that time the subject having been further studied by the author, the correctness of the above view has become more apparent. The opinions of contemporary writers were stated, and with regard to those of Dr. Prout, the following circumstances were named as not satisfactorily accounted for,—the sudden appearance, cessation, and renewal of the symptoms, the normal state of the blood, absence of organic renal disease, and of such constitutional disturbance as would necessarily follow prolonged derangement of the assimilative process, and renal function. The endemic nature of the disease and its frequent association with hœmaturia were mentioned as incompatible with mere functional derangement. The view now proposed would satisfactorily explain these peculiar characters; *ex. gr.* when the lymphatic vessels from any cause are over distended rupture occurring, or a former aperture re-opening, instant flow of chyle would take place, and the distension subsiding, this would as speedily cease. Organic changes, in the blood and kidnies are no necessary concomitants; the connection with hœmaturia would indicate that the capillaries also are equally disposed to congestion and rupture, both being the result of the lax idiosynerasy of structure common in hot climates; other features of the disease were pointed out and made clear on the adoption of these views; the very different states of the urine were shown to be entirely explicable on the

supposition that chyle of various degree of maturation had been intermixed; such admixture accounts for the physical appearances, as Rayer long since proved by experiment. The following facts were then referred to as decisive in confirming the author's opinion:—*First*, that the chemical composition of chyle and of chylous urine shows the proportion of albumen and fat to be the same in each, and such as could not occur from mere coincidence; three examples were drawn up. *Second*, by means of the microscope the author had some time since been able to unmistakably detect the presence of chyle corpuscules in chylous urine, this had not yet been done in Europe, but the fact is indubitable, and also that they present the varieties, in size, form, &c. of healthy chyle according to the degree of elaboration it has undergone. Lastly, a physiological arrangement of the instances of this peculiar affection, according to the locality of occurrence, and consequent appearance and composition, was suggested, three classes being proposed in which all the known published cases had been arranged by the author; a fourth class was proposed under the term "Lymph urine," examples of which were also offered. Although adding nothing directly in aid of treatment, yet these views will, on consideration, furnish suggestions that may lead to better success than has yet been attained,—regulation of diet, and mineral tonics, and astringents amongst others, may be mentioned.

The Secretary then read portions of a Report on Cholera which occurred during the months of April, May, and June, in Sind, by Dr. Grierson, of which the following is a brief abstract. Before commencing to trace the epidemic of the last few months, Dr. Grierson alludes to the ravages of Cholera in former years, thus:—

"Cholera became known to our army in Sind in the year 1839, when in the month of March it attacked the 22nd Regiment N. I. then encamped near the town of Tatta. It presented itself at times, subsequently mostly at Kurrachee, and was most severe and fatal in the year 1846, when 915 persons died amongst the Regiments stationed at Kurrachee. It continued to show itself pretty regularly every year at Kurrachee, till the year 1853, after which it was scarcely seen till last year. It appeared on that occasion to enter the Province from the east-side, and gradually approached Kurrachee. In September, Manora, the town, and the cantonment were invaded, and the disease exhibited an activity which occasioned great alarm and carried off many victims, but its prevalence was not long continued. At the same time it visited other places in lower Sind principally, namely, Jerruck, Shahbunder, Khetty, Sehwan, and Hyderabad slightly, and also Mehur and Shikarpore, in

Upper Sind. The deaths reported to the Civil authorities by this outbreak were 1,777. The disease, which, it was hoped, had passed away not to return, after the short interval of a few months, reappeared in April 1861. On the former occasion Lower Sind was, with two exceptions, the theatre of action of the pestilence. The difference was most marked on this second invasion of this perplexing and tremendous disease. It has seemed to pervade a great part of the whole province, so that out of the deplorable number 8,523 deaths reported by the Police and Civil Officers, there were on the frontier of Upper Sind 167, in the Shikarpore Collectorate 4,192, in that of Hydrabad 1,160, and in that of Kurrachee 3,004. In these two epidemics together, which fall within twelve months considerably, though happening in different years, the sum of reported deaths is 9,700, and if we take the population at 3,000,000, there died on the occasions of cholera 1 in 309 of the population, or 003 per cent. Wide as is the extent over which the disease prevailed from the Frontier of Upper Sind to Shahbunder, and to Thur, and Parkur, from Roree to Manora, it is worthy of remark that the commencement of the outbreak was reported by the Medical observers to have occurred in seventeen places in April, in three in May, in three also in June, and in two in March. It ceased generally in June, but a few cases were reported at a later date."

During the months of April, May, and June 1861, the number of cases reported was 1,673 of which 249 proved fatal or 14.8 per cent. In the Military Hospitals the number of cases was 17, and deaths 9. In the Civil and Police Hospitals, and Dispensaries at the principal stations, the number of cases was 331, and deaths 96. In the superior Civil Stations under Apothecaries and Assistant Apothecaries the number of cases was 253 and deaths 34, whilst in the inferior Civil Stations under Hospital Assistants, the number of cases was 1,072, and deaths 110. The trustworthiness of the returns from some of the dispensaries is doubted, as many of the patients were not seen after their first application for relief. The epidemic it is stated prevailed severely in the districts and villages, and but slightly in the larger and chief stations of the province. The disease differed in extent in the different Collectorates. It prevailed most in that of Shikarpore, next in the Kurrachee, and least in the central Collectorate of Hyderabad. The chief peculiarity about the Sind epidemic of cholera appears to be the absence of spasms or cramps, or at least that they were never very prominent, and sometimes did not appear to attract notice. No one description would apply to every case, whilst yet all cases had something

in common. The treatment consisted chiefly of calomel and opium, internal and external stimulants, chloroform, dilute sulphuric acid, &c. Dr. Grierson says "in the treatment of cholera in a very marked manner is shown the fact that the most contradictory methods have been proposed for its cure. Some think they have divined or discovered the nature of the diseased processes from first to last, and their views of the pathology of the disease suggest to them the treatment they think best fitted to subdue it. Others struck by the urgency of the symptoms are guided to the selection of remedies by the impulse of the desire to afford immediate relief. Of all remedies, however, for the disease, calomel has maintained its place most steadily." With regard to the causes of the Epidemic it is remarked. "In Sind the habitations of the people, especially in the districts, are small and mean, cattle and other live stock are often in closest proximity, and the refuse and waste of organized life lies almost undisturbed amidst and around them. Hence they breathe constantly an impure air. This year was preceded by several years of little rain, it was a year of famine, food was scarce and bad, and many thousands of cattle died. Instead of health and occupation in the fields men pined in their miserable habitations, in hunger and sorrow, with bad water for drink and breathing constantly an impure and deleterious air. These were the conditions in which the epidemic air found the people, favoured in its transport perhaps by the dryness of the atmosphere; and cholera was the result. In the great stations where the disease was less severe, the conditions of life were different. The regularly paid, well fed, troops suffered but very little. The other inhabitants comparatively little. For in these stations and others to some extent, *hygiene* has not been unknown. It is due to Sir Bartle Frere, K.C.B. to state, that in Kurrachee first, and afterwards elsewhere, he originated changes and improvements in this direction which only require extension, improvement, and diligent supervision to give Sind a character of excellence in this respect, and to protect in a great measure its inhabitants from the ill effects of epidemic states of the air. Not simply the removal of refuse, offal, waste, filth of all descriptions, is insisted on; but the disposal of all noxious matters, by inhumation, and incrimation in furnaces, constitute the peculiar features of the hygienic measures adopted in the Province. In the large towns likewise the dwellings are better, occupation is more steady, and the means of subsistence better, and these facts no doubt contributed to the greater immunity of the people from the effects of the epidemic invasion.

A selection of cases from the records of the Kurrachee Charitable Dispensary, by Sub-Assistant Surgeon Bazunjee Rustomjee, were then read (see p. XIII ante), and after the examination of a pathological specimen of aneurism of the arch of the aorta forwarded by Dr. Niven, the President in the name of the Society accorded thanks to the contributors of papers, and adjourned the meeting until Saturday the 4th January 1862.

No. 9.

ANNUAL MEETING HELD 4TH JANUARY 1862.

Present :

A. H. Leith, M.D.; H. J. Carter, Esq., F.R.S.; W. Campbell, M.D.; T. B. Johnstone, M.D.; W. C. Coles, M.D.; G. C. M. Birdwood, M.D.; and H. V. Carter, M.D.

The Secretary read the following Report :—

Annual Report.

During the year 1861 eight Monthly Meetings of the Society have been held, and the average attendance of Members on each occasion has been ten. The chief contributors of Papers have been Dr. Moore ; Dr. H. V. Carter ; Mr. Carter ; Dr. Grierson (through the Principal Inspector General) ; Dr. Haines ; Dr. Hanbury ; and Dr. Gorringe. Numerous minor contributions have been made to the Society through the kindness of the Head of the Medical Department.

2. Five new paying Members have joined the Society, and two have gone off. Three Members have been admitted upon first entering the Service. There are 85 subscribing Members in India, and 17 in Europe, besides Members under two years.

3. The sixth number of the New Series of the Transactions was published in June last, and distributed as usual. It was rather a larger and more costly volume than was desirable. It is proposed that the 7th Number, now in the press, should be somewhat reduced in size and expense, and it is intended to issue it as early as possible.

4. There have been several presents made to the Library by Government, and by the Principal Inspector General ; whilst periodicals, marginally named,* in exchange for our Transactions have been regularly received. The Library has now considerably out-grown the proportions originally contemplated, and requires some re-arrangement and getting rid of old documents and books.

* The "*Dublin Quarterly Review*," the "*British Medical Journal*," and the "*Indian Lancet*."

5. The Finances of the Society, as shown by the accompanying accounts, are much as before, the balance in the Bombay Bank being only about Rs. 200 less than last year.

Annual Statement of Receipts and Disbursements of the Medical and Physical Society from 1st January to 31st December 1861.

Receipts.	Rs.	a.	p.	Disbursements.	Rs.	a.	p.
By Balance of last account closed on the 31st December 1860.....	1,690	5	5	By Amount paid for printing Circulars, &c.....	44	8	0
By Subscriptions received from 1st January to 31st December 1861 ..	988	0	0	By Amount of Office Establishment and Petty Charges, &c.....	291	12	1
By Amount received from Government, being the value of 100 copies of No. 6 of the New Series of the Society's Transactions.....	500	0	0	By Amount paid for printing charges of No. 6 of the New Series of the Transactions	1,341	4	0
				By Balance in the Bombay Bank	1,500	13	4
Total Rupees....	3,178	5	5	Total Rupees....	3,178	5	5

6. The accounts with the Agents have been now squared, and Messrs. Chesson and Woodhall have 85 volumes of the Transactions on their hands for sale. As the annual subscriptions with the Government grant are likely to cover each year's expenses of management, the Committee are about to take into consideration the propriety of investing the sum of Rs. 1,500 in the Bank in 5 per cent. paper, the interest of which might be profitably employed.

7. The Committee of Management and the Secretary now retire from office, but they offer themselves for re-election.

Upon the examination of the votes recorded, the following gentlemen were found to be elected :—A. H. Leith, M.D. (withdrawn, on being about to leave Bombay) ; W. Arbuckle, M.D. ; H. J. Carter, Esq. ; W. Campbell, M.D. ; J. Peet, M.D. ; H. Giraud, M.D. ; W. C. Coles, M.D. ; R. Haines, M.D. ; G. R. Ballingall, M.D.

The election of office-bearers then took place, when Mr. Carter, F.R.S., was elected President ; Dr. Peet, and Dr. Haines, Vice-Presidents, and Dr. Coles, Secretary.

REGULATIONS

OF THE

MEDICAL AND PHYSICAL SOCIETY OF BOMBAY.

ESTABLISHED 1835.

Objects.

I. The encouragement of the cultivation of Medical Science and its collateral branches, by discussion at periodical meetings, and by the publication of original communications.

Constitution.

II. The Society is composed of Ordinary, Corresponding, and Honorary Members.

Ordinary Members.

III. Under the head of Ordinary Members are to be classed all who contribute to the funds of the Society, and all who are admitted in accordance with Regulation VII.

IV. All Medical men residing in India, who can produce certificates of a regular medical education, are eligible as Ordinary Members.

V. Medical Officers of Her Majesty's Indian or British Services are elected Ordinary Members of the Society, on application by letter addressed to the Secretary.

VI. Qualified Medical Practitioners, not belonging to Her Majesty's Indian or British Services, are elected by ballot at the ordinary meetings of the Society, and a majority of three-fourths of the Members present is necessary to secure the election.

VII. Assistant Surgeons, on first entering the Bombay Medical Service, are considered Ordinary Members of the Society, free of the payment of admission fee and annual subscription, and continue so for a period of two years, after which, should they not intimate their wish to be considered Ordinary Members by payment of the regulated admission fee and annual subscription, they are considered to have withdrawn from the Society.

Payments.

VIII. Ordinary Members pay an admission fee of Rs. 5, and annual subscription of Rs. 12, payable in advance in the month of January of each year.

IX. Ordinary Members, absent from India, are not chargeable with subscriptions for the period of their absence.

X. Ordinary Members neglecting to pay their annual subscription for two successive years, are considered to have withdrawn from the Society, and are liable to have their names erased from the list of Members, under a resolution passed to that effect at an ordinary meeting of the Society.

Corresponding Members.

XI. Ordinary Members, on retiring from service in India, on being proposed and seconded at an ordinary meeting of the Society, are eligible, by ballot, as corresponding Members. A majority of four-fifths of the Members present is necessary to secure their election.

Honorary Members.

XII. Medical men of celebrity, not residing in India, are eligible as Honorary Members. On being proposed and seconded at an ordinary meeting of the Society, they may be elected at the next meeting by the unanimous consent of the Members present.

Election of Office-bearers.

XIII. The Committee of Management of the Society consists of eight Members, elected annually from among the Ordinary Members resident in Bombay, by the general vote of the Ordinary Members residing under the Government of Bombay.

XIV. The Voting Lists are circulated in the first week of November of each year, and the result of the election is declared at the annual meeting of the Society.

XV. In the event of vacancies occurring in the Committee between the periods of election, such vacancies to be filled up in rotation by the individuals who commanded the number of votes next to those of the Members returned at the last election.

XVI. A President and two Vice-Presidents of the Society are elected annually from among the Members of the Committee of Management by the Members of the Society present at the meeting at which the annual election of the Committee is declared.

XVII. The Secretary of the Society is elected biennially from among the Ordinary Members resident in Bombay at the annual meeting held in the month of January of alternate years, or, on the occurrence of a vacancy, at any other ordinary meeting of the Society.

Committee of Management.

XVIII. The Committee of Management have the general direction of the affairs of the Society, and decide on what communications are to be published in the Transactions of the Society. They keep minutes of all their proceedings,

which are entered into the Minute-book of the Society, and read at the following ordinary meeting.

XIX. When questions of importance to the stability and interests of the Society arise, they shall be submitted by the Committee for decision to the Ordinary Members residing *under the Government of Bombay*. The majority of votes necessary to decide any question, to be determined according to its importance, and fixed at the time by the Committee.

XX. It shall form part of the duty of the Committee to give due consideration to all suggestions offered by Members of the Society. Should it be represented to the Committee that the conduct of a Member of the Society is disgraceful, in a professional or social capacity, the Committee may, if they deem it necessary, bring the question, of his expulsion before a Special Meeting of the Society, at which the votes of three-fourths of the Members present are necessary to decide it affirmatively.

President and Vice-Presidents.

XXI. The President shall take the Chair and conduct the business at all meetings of the Society.

XXII. In the absence of the President, one of the Vice-Presidents shall take the Chair, and conduct the business of the meeting; and in case neither be present, the senior Member at the meeting shall preside.

Secretary.

XXIII. The Secretary is a Member of the Committee of Management *ex officio*.

XXIV. It shall be his duty to enter into the Minute-book of the Society minutes of the proceedings of all meetings and transactions of the Society, and, in communication with the Committee of Management, to conduct the details of business, and carry on the correspondence of the Society.

XXV. The Secretary shall prepare an annual statement of the receipts and disbursements of the Society, to be laid before the annual meeting in the month of January of each year.

XXVI. To enable the Secretary to perform these duties a suitable establishment is entertained, under sanction of the Committee of Management, confirmed at an ordinary meeting of the Society.

Meetings.

XXVII. Ordinary meetings of the Society are held in Bombay on the first Saturday of every month, except in April, May, and June.

XXVIII. The chair being taken, the order of business shall be as follows:—

1. The minutes of the last meeting, and those of subsequent Committee meetings to be read and confirmed.
2. The announcement and election of new Members in accordance with Regulations V., VI., and VII.
3. The election of Corresponding and Honorary Members.
4. The reading of letters, and the discussion of any ordinary business of the Society which may be before the meeting.
5. The announcement of presents and donations.
6. That of papers and dissertations received since the last meeting.

XXIX. After the announcement of the papers and dissertations, the President shall call upon the Secretary to read one or more of them, and shall subsequently

invite the Members to discuss any particular part of them which they may consider deserving of remark.

XXX. No new business shall be introduced until that which is before the meeting has been concluded.

Papers and Dissertations.

XXXI. All papers and dissertations presented to the Society to be considered the property of the Society.

XXXII. The Transactions of the Society are published by the Secretary, in communication with the Committee, as often as circumstances will admit.

XXXIII. A copy of each publication is presented to the Honorary and Corresponding Members of the Society, and to every Ordinary Member who, at the time of publication, is a contributor to the funds of the Society.

N. B.—All communications addressed to the Secretary or Treasurers must be prepaid.

Members are requested to pay the amount of their subscriptions to the Bank of Bombay, Treasurers to the Society.

☞ The Publications of the Society are for sale by Messrs. CHESSON and WOODHALL, Booksellers, Bombay, the Society's Agents.

The First Series of the Transactions of the Society consist of—

No.	1, 1838	Pp.	370	Rs.	5
,,	2, 1839	,,	269	,,	5
,,	3, 1840	,,	225	,,	3
,,	4, 1841	,,	156	,,	3
,,	5, 1842	,,	196	,,	3
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,,	8, 1845-46.....	,,	122	,,	3
,,	9, 1847-48.....	,,	264	,,	5
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The Index to the above.....				,,	1

The Second Series of the Transactions consist of—

No.	1, 1851-52.....	Pp.	356	Rs.	5
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,,	6, 1860	,,	484	,,	5
,,	7, 1861	,,	354	,,	5

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FOR THE YEAR 1862.

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